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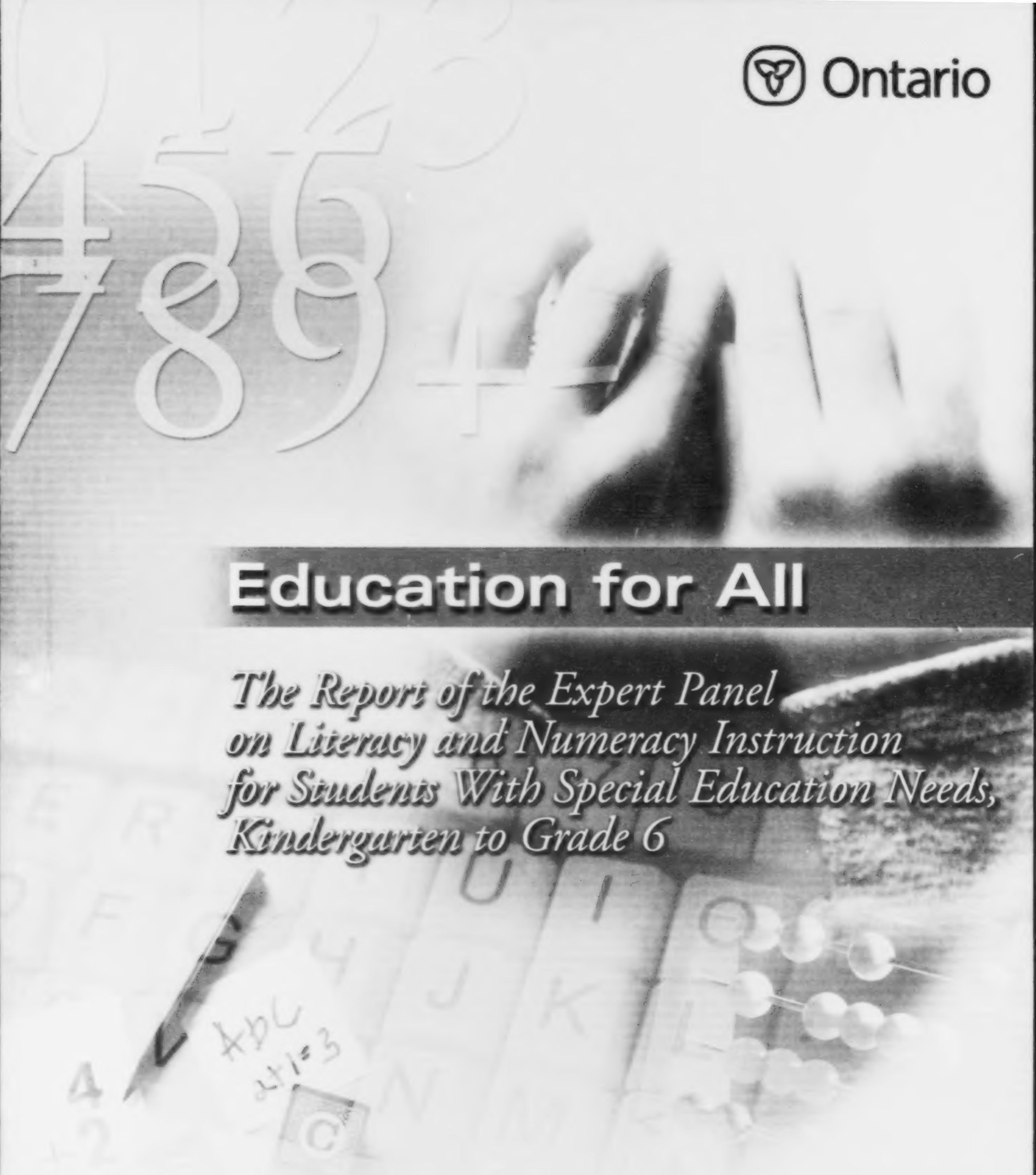

Education for All

The Report of the Expert Panel on Literacy and Numeracy Instruction for Students With Special Education Needs, Kindergarten to Grade 6

2005

Ontario Education excellence for all

The preparation of this report by the Expert Panel on Literacy and Numeracy Instruction for Students With Special Education Needs was financially supported by the Ontario Ministry of Education. The Expert Panel was made up of educators and researchers. This report reflects the views and opinions of the panel members, and does not necessarily reflect the views, opinions, and policies of the Ministry of Education.

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The Expert Panel on Literacy and Numeracy Instruction for Students With Special Education Needs wishes to express its gratitude to the staff of the Special Education Policy and Programs Branch of the Ministry of Education for their administrative support during the preparation of this report.

The members of the Expert Panel extend their thanks to the Minister's Advisory Council on Special Education (MACSE) for suggesting the creation of an expert panel to present this report on literacy and numeracy components for students with special education needs.

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This publication is available on the Ministry of Education's website, at http://www.edu.gov.on.ca.

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1

Introduction

About This Report

The Ministry of Education established the Expert Panel on Literacy and Numeracy Instruction for Students With Special Education Needs to recommend practices, based on research, that would allow Ontario's teachers to improve and reinforce effective instruction of reading, writing, oral communication, and mathematics to students from Kindergarten to Grade 6 who have special education needs.

Education for All: The Report of the Expert Panel on Literacy and Numeracy Instruction for Students With Special Education Needs, Kindergarten to Grade 6 was built on a powerful foundation – Ontario's ambitious province-wide process of consultation and professional learning on literacy and numeracy. The Expert Panel is deeply indebted to the groundwork of its predecessor panels. *Early Reading Strategy: The Report of the Expert Panel on Early Reading in Ontario* and *Early Math Strategy: The Report of the Expert Panel on Early Math in Ontario* were released in 2003; *Literacy for Learning: The Report of the Expert Panel on Literacy in Grades 4 to 6 in Ontario* and *Teaching and Learning Mathematics: The Report of the Expert Panel on Mathematics in Grades 4 to 6 in Ontario* were released in 2004.

Historical Context

Special education in Ontario has evolved in the context of a broad social movement advocating the closure of residential institutions, which had housed many persons with special needs, and the inclusion of these persons, with appropriate support services, as fully as possible, in the life of the community.

The legal requirement that schools serve all children with special needs is fairly recent. Until the early 1950s, parents and caregivers were expected to take responsibility for the provision of education for children with special needs. During the thirty years from 1950 to 1980, students with special learning needs were inconsistently served. Many were placed in regular schools, but accommodations were usually not provided. Some drifted away from school, while others managed to obtain some measure of formal education through luck, individual teacher support, and family intervention. For many children with severe difficulties, the provision of education remained a parental or community responsibility until 1980. Although the Hope Commission recommended expansion of special education programs in 1950, educational reforms did not get under way until the 1960s and into the 1970s.

In 1962, the Government of Ontario repealed most of its human rights laws in order to make way for the Ontario Human Rights Code, the first comprehensive human rights code in Canada. The Code affirmed the right to equal access to services, including education. However, it was not until 1982 that the Code was amended to prohibit discrimination on the basis of handicap.

Through the 1970s, major reforms initiated in the previous decade, such as the Robarts Plan and the Hall-Dennis Report, were implemented in Ontario classrooms. Programs and services for students with special needs, however, were still lacking. School boards were still not required to offer special education programs and services, although some did. It was not until 1980 that Ontario's Education Amendment Act, also known as Bill 82, required Ontario school boards to provide special education programs and services for all students with special education needs.

In most jurisdictions it became standard practice to place students with special education needs in regular schools but in self-contained classes according to their particular needs. This practice was generally known as "mainstreaming" or "integration (in a regular school)". A series of landmark reports published in the 1970s, including *One Million Children: A National Study of Canadian Children with Emotional and Learning Disorders* (Roberts & Lazure, 1970) and *Standards for Education of Exceptional Children in Canada* (Hardy, McLeod, Minto, Perkins, & Quance, 1971), encouraged parents and educators alike to begin questioning the value of special education programs that isolated students from regular education programs. Public support grew for the inclusion of children with exceptionalities into the regular classroom.

The Canadian Charter of Rights and Freedoms, which came into effect in 1982, created concerns that a school board's decision to place a student in a separate, special class might be a violation of his or her equality rights under the Charter. The 1997 Supreme Court decision in the Eaton case made it clear that placement of children with special education needs should be decided on a case-by-case basis, with the key determinant being the student's best interests.

Regulation 181, enacted in 1998, legislated the requirement that the first consideration regarding placement for an "exceptional pupil" be placement in a regular class with appropriate supports, when such placement meets the student's needs and is in accordance with parents' wishes. Ministry policy requires that a range of options continue to be available for students whose needs cannot be met within the regular classroom.

Today's Context

Regular classroom teachers in Ontario serve a growing number of students with diverse abilities. According to school board statistics, most students with special needs spend at least 50 per cent of their instructional day in a regular classroom, being taught by regular classroom teachers. It is imperative that inclusion means not only the practice of placing students with special needs in the regular classroom but ensuring that teachers assist every student to prepare for the highest degree of independence possible.

Ontario's Education Act specifically defines "exceptional pupil" and recognizes categories of behavioural, communicational, intellectual, physical, and multiple exceptionalities. For the purposes of identification of "exceptional pupils", there are currently twelve exceptionality definitions. Many Ontario students have not been formally identified as "exceptional", but still exhibit abilities that indicate that they are in need of special education programs and/or services.

In any given classroom, students may demonstrate an extensive range of learning needs. Some may, for instance, have difficulties with reading, writing, or mathematics. Others may be new to our languages and culture, or speak another language with more fluency than the language of the classroom. Still others may read complex books or understand advanced mathematical concepts. Some may appear to lack motivation or be underachievers relative to their abilities. Whatever the reasons for the student's needs, teachers must be prepared to respond effectively and ensure that each student is learning to his or her potential.

The Expert Panel has taken an inclusive, non-categorical – rather than exceptionality-based – approach to address programming for students with special education needs. This report has been written to assist teachers in helping all of Ontario's students learn, including those students whose abilities make it difficult for them to achieve their grade-level expectations.

> *"Language traditions and language rights influence the nature and development of a culture.... Aboriginal communities in Ontario are seeking to preserve and develop their languages through community-based literacy learning. As well, Ontario has a long tradition of growth through immigration, with many people from around the world bringing their language, culture, and experiences to this country. With increasing globalization and the shift to an information economy, the diverse backgrounds and experiences of all people become a resource base that can enrich life and benefit all Ontarians."*
>
> *(Expert Panel on Literacy in Grades 4 to 6 in Ontario, 2004, pp. 6–7)*

French-Language Education

The French language is recognized in law as an important component of the cultural identification of students in French-language schools, not just as a tool for reading and writing. The French language is an essential part of daily life in francophone communities across Ontario. Ontario's schools protect the right of the French linguistic minority populations to receive instruction in their own language, as set out in section 23 of the Canadian Charter of Rights and Freedoms. Ontario's Aménagement linguistique policy, released in 2004, is intended to ensure the protection, enhancement, and transmission of the French language and culture in minority settings. This policy also specifies parameters for French-language education.

What We Believe

The following beliefs sum up the Expert Panel's guiding principles and the key themes of this report.

Belief 1: All students can succeed.

All students can demonstrate competence in literacy and numeracy. Teachers can ensure their students' success by getting to know them through ongoing observation, assessment, and evaluation, and then carefully establishing the next steps each student needs to take in order to learn.

Belief 2: Universal design and differentiated instruction are effective and interconnected means of meeting the learning or productivity needs of any group of students.

Universal design ensures that the classroom and other learning environments are as usable as possible for students, regardless of their age, ability, or situation. Teachers should also aim to respond to the specific learning profiles of individual students with differentiated instruction.

Belief 3: Successful instructional practices are founded on evidence-based research, tempered by experience.

Children with special needs benefit most when teachers deliver programming informed by both professional judgement and domain knowledge supported by empirical evidence. Good pedagogy is based on good research. Basing instruction on sound research will avoid the pitfall of following trends that lack efficacy.

Belief 4: Classroom teachers are the key educators for a student's literacy and numeracy development.

Students with special education needs may receive important support and programming from a number of people, but the key educator for literacy and numeracy development is the classroom teacher(s). Classroom teachers are ideally placed to gather ongoing assessment data and monitor student learning. They have the advantage of knowing the child well and can provide valuable feedback for others working with the student.

Belief 5: Each child has his or her own unique patterns of learning.

Patterns of learning may vary greatly within a classroom. Teachers need to plan for diversity, give students tasks that respect their abilities, use dynamic and flexible grouping for instruction, and provide ongoing assessment.

Belief 6: Classroom teachers need the support of the larger community to create a learning environment that supports students with special education needs.

Teachers have a challenging and complex job. It is their responsibility to create the best possible learning environment for each and every student in their classrooms. Teachers can best help their students succeed when they are able to reach out to the larger community of learners. Teachers need support from their principal, special education resource teacher(s), other classroom teachers, and other professionals. Families and community support agencies are crucial contributors. Everyone has a place in the process.

Belief 7: Fairness is not sameness.

Treating all children exactly the same means that children who need accommodations or modifications to the program in order to succeed will be disadvantaged. Some students require more or different support than others in order to work at a level appropriate to their abilities and needs.

How to Use This Report

The Expert Panel's goal was to develop a framework, based on solid research, that would support the efforts of Ontario's teachers to improve the quality of instruction for all their students, from Kindergarten to Grade 6. This report provides Ontario teachers with specific strategies that will help them teach literacy and numeracy more effectively to students with diverse strengths and needs; show them how to develop a learning profile of classrooms and of individual students; provide assessment, evaluation, and planning strategies; and provide detailed information on instructional support and assistive technology. To maximize its usefulness, the report complements existing ministry curriculum documents, resource documents, and guides to effective instruction, as well as previous expert panel reports on literacy and numeracy.

This report can become an invaluable day-to-day resource for educators, a useful hands-on reference document that will enable every classroom teacher to fully support all the students in his or her classroom. At the same time, we recognize that its content is based on what we know now. Future findings, driven by new technologies, research, and teaching tools will continue to shape our own learning as well as the possibilities for Ontario's students.

Expert Panel on Literacy and Numeracy Instruction for Students With Special Education Needs

The panel's members include English- and French-language teachers, principals, consultants, researchers, and professors from Catholic and public school boards and universities across Ontario. Each member has demonstrated expertise and leadership in the teaching of reading, writing, and mathematics to students with special learning needs.

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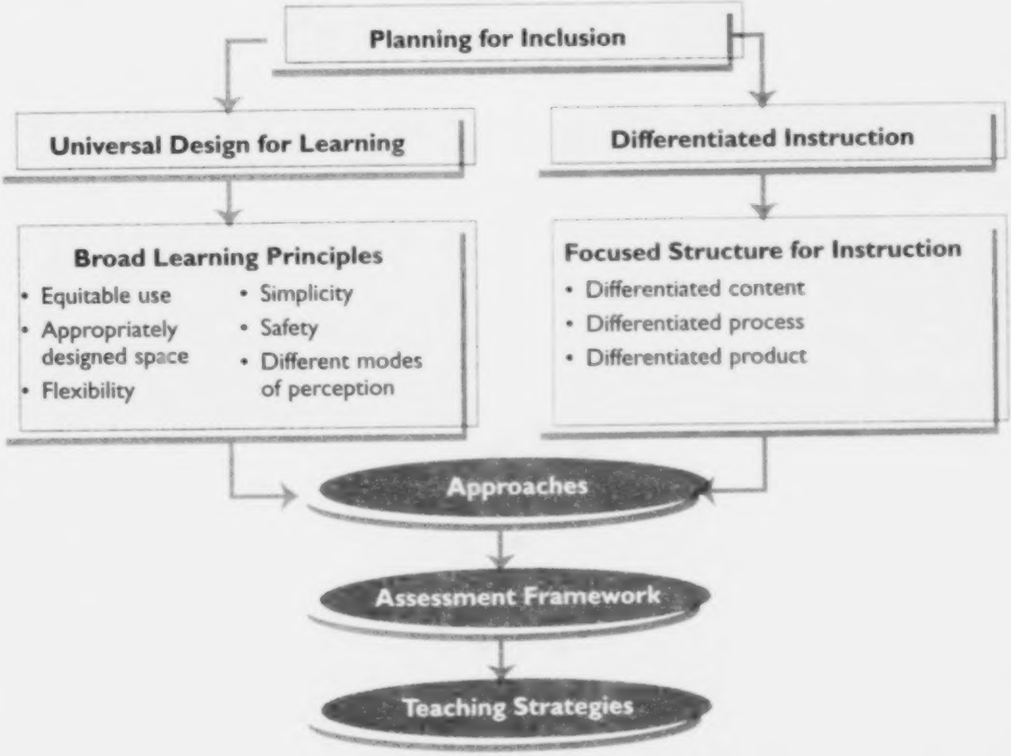
2 Planning for Inclusion: Universal Design for Learning and Differentiated Instruction

As indicated in Chapter 1, inherent in several of the Expert Panel's core beliefs is the need for teachers to plan for diversity if their students are to gain the greatest benefits from the teaching and learning process. They can plan for learning in a diverse, inclusive environment through the principles and guidelines provided by Universal Design for Learning and differentiated instruction.

Figure 1. Planning for Inclusion


Planning for Inclusion
Universal Design for Learning
Differentiated Instruction
Broad Learning Principles
• Equitable use
• Appropriately designed space
• Flexibility
• Simplicity
• Safety
• Different modes of perception
Focused Structure for Instruction
• Differentiated content
• Differentiated process
• Differentiated product
Approaches
Assessment Framework
Teaching Strategies

Universal Design for Learning (UDL)

> *"Universal Design is not just a technique for special education; rather it is a technique to enhance the learning of all students."*
>
> *(Turnbull, Turnbull, Shank, Smith, & Leal, 2002, p. 92)*
>
> *"With the premise that each student can benefit from a flexible curriculum offering clear goals, multiple pathways for reaching those goals, and fair and accurate assessment, the Universal Design Curriculum reflects an understanding that each learner is unique."*
>
> *(Hitchcock, Meyer, Rose, & Jackson, 2002, p. 20)*

Universal Design for Learning (UDL) was inspired by work in architecture on the planning of buildings with a view to accessibility for people with physical disabilities (Turnbull et al., 2002). Architects observed that the added improvements facilitated access for all users, not just people with physical disabilities. An access ramp, for instance, provides a person using a wheelchair with easier access to a building, but it also makes it easier for a parent with a child's stroller, a traveller with a baggage trolley, or someone using a walker.

Eventually, researchers in other fields noted that specialized technology meant for a target population is also useful for others. Subtitles originally designed to help people who are deaf or hearing impaired, for instance, now replace the sound of televisions in loud places such as airports and sports centres, or, inserted into films on DVDs, help teach languages.[1]

The notion that assistance targeted at a specific group can help everyone, bolstered by recent research on inclusion and new technologies, has now made its way into the field of education. Educators have begun to realize that a teaching strategy or pedagogical materials that respond to the special needs of a specific student or group of students can also be useful for all students.

UDL is an orientation intended to shape teaching in order to provide all students with access to the curriculum (Turnbull et al., 2002). Its aim is to assist teachers in designing products and environments to make them accessible to everyone, regardless of age, skills, or situations.

UDL sees all learning as a continuum. Every student is unique, and will therefore benefit from a flexible curriculum that provides him or her with the appropriate pathways for reaching learning goals, as well as fair and accurate assessment.

A classroom based on the concept of UDL is specifically planned and developed to meet the special needs of a variety of students, including students who are disabled and those who come from a non-dominant culture. It is flexible, supportive, and adjustable, and increases full access to the curriculum for all students.

---

[1] Information from this and the previous paragraph is from Hitchcock et al., 2002.

> *"In a diverse classroom, no single method can reach all learners. Multiple pathways to achieving goals are needed."*
>
> *(Hitchcock et al., 2002, p. 18)*

Universality and equity. UDL is intended to ensure that teaching will meet the needs of all students. This does not mean planning instruction for students with average achievement levels, and then making after-the-fact modifications to meet the special needs of certain students. UDL encourages teachers to develop a class profile and then plan, from the beginning, to provide means and pedagogical materials that meet the needs of all students and not only those with special needs. Classrooms accommodate all students and a wide range of instructional methods. While teaching, the teacher attends to the needs of each student, and guides him or her in making the choices best adapted to his or her needs. All students enjoy privacy, security, and safety. None is segregated or stigmatized.

Flexibility and inclusion. The planning of teaching and the time teachers allocate to students' activities and needs must be sufficiently flexible to provide real learning experiences for all the students, regardless of their performance level. Students are accommodated through a variety of teaching strategies and pedagogical materials that make use of all the senses, technological media, assessment strategies, and ways of using space. Teachers can use a variety of techniques or devices to accommodate a variety of diverse students in their classrooms. Some students require right- or left-handed access, for instance, or the option to make oral versus written presentations.

An appropriately designed space. Teachers can make sure that:

- all students have a clear line of sight;
- resources such as dictionaries and texts are within comfortable reach of all students;
- there is adequate space for the use of assistive devices or teachers' assistants;
- classroom tools accommodate variations in hand grip size;
- classrooms minimize distraction – students should be able to concentrate on instructional elements (such as posters on the wall) without having to process a plethora of other competing stimuli.

Simplicity. Teachers avoid unnecessary complexity by communicating consistent expectations, arranging information sequentially to clarify its relative importance, breaking instructions down into small steps, and providing effective feedback during and after tasks. They minimize distracting information in the classroom.

Safety. Classrooms must be safe, with minimal hazards and no elements that might cause accidents. The assessment of safety might depend on the specific children in the classroom. If any student has a safety plan or written safety protocol, every adult within the school needs to be aware of it and able to act on it.

UDL takes the many components of teaching into account:

- expectations and objectives of learning situations
- teaching strategies and learning situations
- pedagogical materials
- technological tools
- variety of products resulting from learning situations
- assessment

The following example, in which students are expected to be able to identify the components of the structure of a short story, illustrates the use of UDL.

Overall and specific objectives and expectations

The objective of reading a story could be understanding the structure of a story, analysing the values conveyed by the text, developing an enjoyment of reading that type of text, analysing its verb tenses, and so on. In this case, the teacher precisely communicates, through discussion, that the objective of this assignment is to understand the structure of a story. The teacher also provides the students with his or her expectations in terms of the quality of learning they must achieve.

Teaching strategies and learning situations

Once the teacher has defined overall and specific expectations and objectives, the teacher provides students with achievable challenges through a variety of flexible strategies or learning situations to meet the needs of the students in ways that are adapted to their skill level.

A student who has not had very much contact with short stories, for instance, might need to have stories read to him or her and to work with the teacher or a more advanced peer. Other students who are already familiar with the story type might benefit by working alone with stories. Students could also choose to start with a story and deduce its structure, while others could choose to start with the story structure and identify its components in a story. The teacher could suggest that students select one of the following:

- Join with the teacher and other students in discussing the structure of the story as the teacher reads it.
- Read the story yourself and try to describe the structure of the story, alone or in a team.
- Read the story and try to describe its structure guided by a poster prepared by the teacher that has general information about the structure of a short story (with examples).
- Write your own story, alone or in a team, applying the structure of a short story to it, guided by the poster.

Pedagogical materials

Pedagogical materials available to everyone may vary:

- *in form:* short stories in classroom books, audio versions, books on computer-based media, and books in braille or large print;
- *in level of difficulty:* stories of different lengths using various numbers of illustrations, stories with sentence structures of varying complexity, and so on;
- *in presentation:* fonts of different sizes and books of different sizes to facilitate their manipulation.

UDL integrates this variety of materials from the beginning of planning the teaching process. These materials should address multiple senses, individually or in combination, and could include text, pictures, graphs, mapping and images, sounds, voices, manipulatives, and so on.

Technological tools

Technology is used whenever necessary to facilitate students' learning. It includes a variety of technological tools that assist learning, such as computers, screens with enlarged display, audio books, hearing apparatus, and so on. Detailed information on assistive technology is presented in Chapter 10.

A variety of student products

UDL is meant to encourage a varied range of productions. Students could demonstrate their comprehension of the structure of the story by illustrating the main steps of the story, giving an oral presentation, or performing a dramatized version.

A similar approach is productive in mathematics. Table 7, A Sample Grade 1 Guided Mathematics Lesson, in Chapter 7 of this report, includes an example of how Universal Design for Learning might apply to mathematics. Instructional approaches in mathematics that allow the integration of concepts consistent with UDL include:

- using shared mathematics to explore a problem;
- using guided mathematics to model and guide through a specific concept;
- using concrete materials/manipulatives;
- making connections to a similar problem;
- using a math game that develops the concept and skills related to the activity or problem.

Assessment and evaluation

Teaching requires accurate knowledge of student progress. Assessment consistent with UDL is sufficiently flexible to provide accurate, ongoing information that helps teachers adjust instruction and maximize learning. A test given in a single medium inevitably tests mastery of that medium (Rose & Meyer, 2002). If a student is provided with accommodations in instruction, he or she frequently receives the same types of accommodations in assessment.

> *"Behind every standard, uniform and abstract [idea of a] student, there is a … real-life student that cannot be ignored, especially if you want to help him or her to not stay where he is, to come out of his shell and to open up to others."*
>
> *(Zakhartchouk, 2001, p. 23)*

A teacher may wonder "How do I manage many reading and math groups in one classroom? How do I manage the mixed abilities of the students in my classroom (well below grade level to well above grade level)?" Differentiated instruction can provide the answer to these difficult questions.

The theory behind differentiated instruction comes from the views of Vygotsky (1980). According to Vygotsky, social context and the interactions of the student within that social context play a fundamental role in the acquisition of knowledge. Students in their "zone of proximal development" can, with assistance, resolve a problem that they could not have resolved alone and move on to another level of knowledge. Teachers can help accelerate students' cognitive development (Vienneau, 2005) by supporting children in resolving problems, by questioning their conceptions, and by asking them to justify their positions (Lafortune & Deaudelin, 2001). They can also provide specific interventions, known in this context as "scaffolding".

While Universal Design for Learning provides the teacher with broad principles for planning, differentiated instruction allows teachers to address specific skills and difficulties (Raynal & Rieunier, 1998).

Differentiated instruction requires teachers to transform their practices from a program-based pedagogy to a student-based pedagogy. Teachers attempt to adapt pedagogical interventions to the needs of each student, acknowledging that each student differs in interests, learning profile, and level of functioning. Differentiated instruction may facilitate high levels of both student engagement and curricular achievement (Caron, 2003; Tomlinson, 2004).

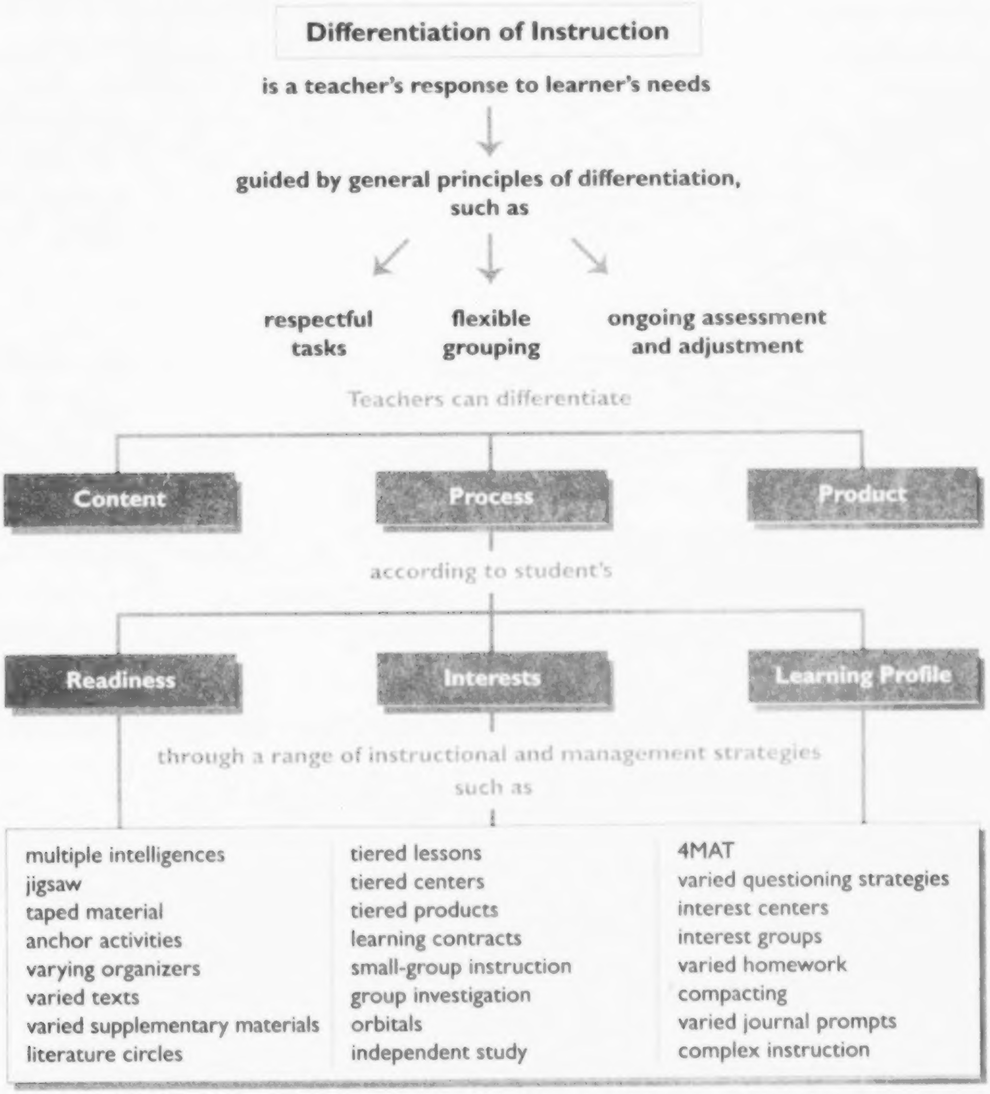
Curriculum tells teachers *what* to teach, while differentiated instruction tells teachers *how* to teach it to a range of learners by employing a variety of teaching approaches. Students can develop their potential if they are provided with appropriate activities in an environment that is planned and organized to meet the needs of all students. The teacher can differentiate one or a number of the following elements in any classroom learning situation (Tomlinson, 2004):

- the content (what the students are going to learn)
- the processes (the activities)
- the products (the accomplishment following a learning period)

Differentiating instruction can include using a variety of groupings to meet student needs; providing accommodated instruction/assessment activities where required; and challenging students at an appropriate level (through modifications), in light of their readiness, interests, and learning profiles. In a differentiated class, the teacher provides instruction at the level students have reached in terms of the curriculum. The learning goals must be adjusted to the abilities of each individual. Students should be observed and evaluated in the learning situation to determine what the expectations should be, using a formative approach; periodic overviews of skills should be done and decisions should be made based on progress.

Differentiating instruction may also include flexible grouping strategies; all students working on the same activity (individually, in small groups, or as a whole group); and assigning different tasks in different situations. Teachers use varied techniques that allow the students to acquire knowledge and skills. Teachers can create alternative ways for students to demonstrate knowledge and skills, such as using drawings or other visual means to organize or generate ideas. Teachers can explore ways to infuse logical accommodations that can benefit all students. For example, teachers can highlight important words in text or allow students to record their answers on a tape recorder.

Figure 2. A Concept Map for Differentiating Instruction


Differentiation of Instruction
is a teacher's response to learner's needs
guided by general principles of differentiation, such as
respectful tasks
flexible grouping
ongoing assessment and adjustment
Teachers can differentiate
Content
Process
Product
according to student's
Readiness
Interests
Learning Profile
through a range of instructional and management strategies such as
multiple intelligences
jigsaw
taped material
anchor activities
varying organizers
varied texts
varied supplementary materials
literature circles
tiered lessons
tiered centers
tiered products
learning contracts
small-group instruction
group investigation
orbitals
independent study
4MAT
varied questioning strategies
interest centers
interest groups
varied homework
compacting
varied journal prompts
complex instruction

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Linking the broad principles of Universal Design for Learning with the focused features of differentiated instruction provides the teacher with a strong foundation for selecting appropriate approaches. Teachers already use many instructional techniques, such as cooperative learning, project-based or problem-based approaches to learning, and explicit instruction, that can be very compatible with the principles of Universal Design for Learning and differentiated instruction.

Cooperative learning approach

Cooperative learning emphasizes small-group work. The teacher puts students with different abilities and talents into a small group and assigns that group a specific task, with the requirement that the students work together to achieve this goal (Clarke, Widerman, & Eadie, 1992; Howden & Kopiec, 1999; Howden & Martin, 1997; Perrenoud, 1998a). The teacher needs to structure the task so that no member of the team can complete it on his or her own (Arcand, 2004; Clarke, et al.; Howden & Kopiec; Howden & Martin).

These groups foster both positive interdependence and responsibility. All the students share the same goal as well as knowledge, expertise, and resources, and together actively participate in searching for a solution. They grow to understand that their own involvement and their efforts provide solid support for their teammates and are essential for the success of the team (Arcand, 2004). Students use their social interactions within the group to verbalize and reformulate their ideas, confront each other with new ideas, and discuss and compare their ways of learning. As a result, they are able to clarify and better understand important concepts.

In addition, students learn appropriate social behaviour and skills when they are put into a learning situation that requires them to work constructively with a group. They learn to listen to one another, help and provide constructive criticism to one another in a courteous manner, and encourage others to express themselves (Gamble, 2002; Arcand, 2004). Within this non-threatening environment where they are allowed to make mistakes, students are even able to take risks in their attempts to solve a problem (Clarke et al., 1992; Howden & Kopiec, 1999; Howden & Martin, 1997).

Project-based approach

This approach requires the teacher to facilitate learning through projects. For example, a student may bring in a seashell, and after group discussion this may result in a great variety of "projects" – books, artwork, posters. Students may be required to analyse data, develop a synthesis, and present their newly acquired knowledge (Francoeur-Bellavance, 2001). Essentially, students take responsibility for acquiring knowledge, interacting with peers and the environment, while the teacher's role is to mediate between students and the knowledge to be acquired (Arpin & Capra, 2001; Francoeur-Bellavance; Perrenoud, 1999).

This approach gives students' work meaning, and allows them to do work based on real issues and to experience an authentic task in a real-life context.

The open nature of project-based learning also allows students to choose subjects they are interested in, at their own level (Leclerc, 1998, 2000). Furthermore, teachers can use open questions to provide students in mixed-ability groupings with the opportunity to work simultaneously on a number of options.

Teachers should demonstrate that they value what their students learn through the process of seeing the project through to completion as much as they value the end product (Morisette, 2002; Perrenoud, 1998a), and make sure that they find at least one task appropriate to each student.

This approach does not, however, guarantee skills development. Teachers need to monitor carefully that students are attempting tasks at the most appropriate instructional level (Perrenoud, 1997, 1999).

Problem-based approach

This approach, originally developed in faculties of medicine, requires the teacher to present students with a realistic, believable problem that they can solve only through the acquisition of a new skill. Students reflect on the best process or strategy for solving the problem, and are also encouraged to develop or question effective procedures used in other problem situations (Perrenoud, 1998a).

Teachers can create some problem situations for very specific purposes, and allow others to arise in a less planned manner. In both cases, they should carefully plan what they want to work on and what cognitive challenges they wish to provide their students.

Like the project-based approach, the problem-based approach requires students to overcome obstacles to develop new knowledge and skills, use authentic and personally relevant situations, and conduct comprehensive, complex, goal-oriented, and meaningful tasks. The main difference is that the teacher, not the student, chooses the task. While students may be less motivated to do work they have not chosen, teachers can cover specific subjects and make sure that students are challenged just enough to grow in their learning. As Perrenoud (1998a) points out, it is not necessary to make every problem situation into a project.

The teacher's challenge when using this approach is to ensure differentiation of instruction. It is tempting in problem-solving tasks for teachers to favour the most able, vivacious, perceptive, and independent students (Perrenoud, 1998a).

Explicit instruction

One of the foundational goals of education is to educate students to become life-long, independent learners. While some students are readily able to work independently and will need little guidance to acquire effective learning strategies and skills, others will require greater assistance. Furthermore, students' abilities to work independently may vary depending on the specific learning task at hand (e.g., completing a math problem-solving activity versus writing a persuasive essay). In other words, students' abilities to learn independently fall on a continuum, so teachers must provide students with a range of structured to unstructured learning opportunities (Pressley, Wharton-McDonald, Mistretta-Hampston, & Echevarria, 1998; Pressley, Yokoi, & Rankin, 1996).

Some students, especially those with special education needs, will require instruction that uses overt thinking processes (e.g., using modelling and think-aloud), or what is sometimes referred to as explicit instruction (Gaskins, 1998; Kamil, Mosenthal, Pearson, & Barr, 2000; National Reading Panel, 2000).

Explicit instruction requires teachers to frequently model appropriate learning strategies. To help students "discover" that a strategic approach is superior to a non-strategic one, teachers can:

- verbalize their thought processes, including the steps they take in a strategy or learning process, as well as the parameters associated with the use of these thought processes;
- share relevant personal learning experiences related to the concept or strategy they are teaching;
- provide students with opportunities to practise using the strategy, guiding their attempts to do so until they can carry out the strategy independently (Almasi, 2003; Woloshyn, Elliott, & Kaucho, 2001).

Learning how to use strategies effectively requires time and motivation. Initially many students will require substantial time and extensive guidance and support to learn how to execute effective learning strategies. With practice, students can learn to execute strategies faster and more competently. Over time and with the gradual introduction of multiple learning strategies, students can develop repertoires of effective learning tools (Almasi, 2003; Collins-Block & Pressley, 2002; Duffy, 1993; Pressley & Woloshyn, 1995; Woloshyn, Elliot, & Riordan, 1998).

3

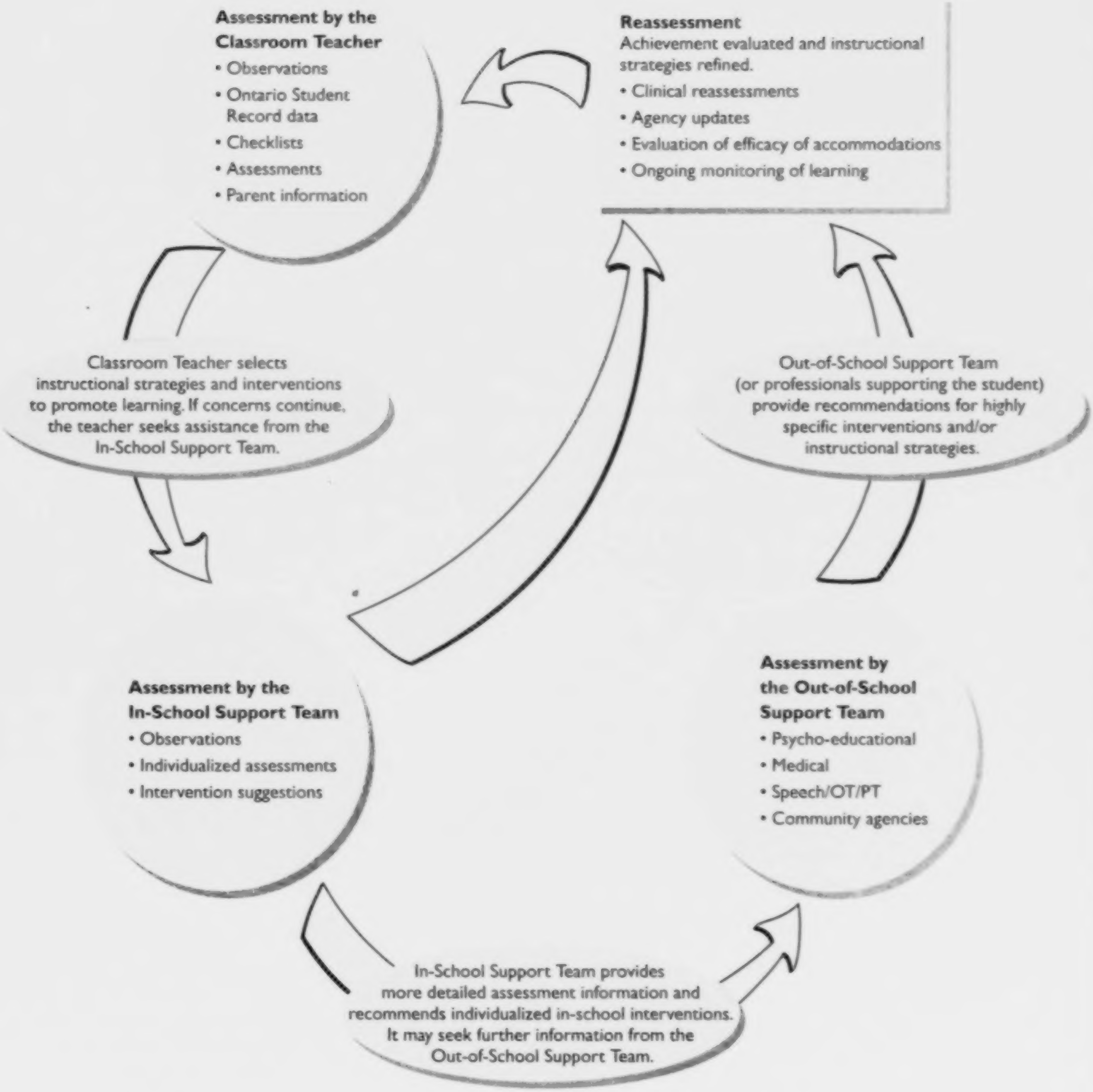
Assessment and Evaluation of Students With Special Education Needs

Accurate assessment and evaluation are critically important to teachers who are committed to including students with special needs in regular classrooms.

The assessment process is multidisciplinary, and occurs in a continuous cycle that is fully integrated into the learning–teaching process: at the outset of work; as work progresses; and at the conclusion to any work. It is also multi-tiered, beginning and ending with the classroom teacher and leading to an ongoing evolution of effective instruction, reassessment, and access to opportunities for achievement based on changing student needs (Salvia, 1990).

The continuous assessment process builds upon the process recommended in *Special Education: A Guide for Educators* (Ontario Ministry of Education, 2001, p. 9). Teachers can use it when they need increasing levels of support to help them develop instructional interventions for their students. The assessment process is illustrated in Figure 3, on page 20.

Figure 3. The Continuous Assessment Process



Assessment by the Classroom Teacher
- Observations
- Ontario Student Record data
- Checklists
- Assessments
- Parent information

Classroom Teacher selects instructional strategies and interventions to promote learning. If concerns continue, the teacher seeks assistance from the In-School Support Team.

Assessment by the In-School Support Team
- Observations
- Individualized assessments
- Intervention suggestions

In-School Support Team provides more detailed assessment information and recommends individualized in-school interventions. It may seek further information from the Out-of-School Support Team.

Assessment by the Out-of-School Support Team
- Psycho-educational
- Medical
- Speech/OT/PT
- Community agencies

Out-of-School Support Team (or professionals supporting the student) provide recommendations for highly specific interventions and/or instructional strategies.

Reassessment
Achievement evaluated and instructional strategies refined.
- Clinical reassessments
- Agency updates
- Evaluation of efficacy of accommodations
- Ongoing monitoring of learning

Before elaborating on the stages shown in Figure 3, it is critical that we clarify our terminology. Many people consider *assessment* and *evaluation* synonymous processes. One may further confuse *educational assessment* with a specific type of assessment, *psycho-educational assessment*. Please refer to the definitions in Table 1 to understand the distinctions among these terms as they are used in this document.

Table 1. Assessment and Evaluation: Definitions of Terms

Assessment

Assessment is the process of systematically gathering information about student learning and/or cognition from a variety of sources, using a variety of techniques and tools. This information can be used to develop class and individual profiles. Assessment can relate to the instructional or working environment and/or the requirements of a particular strand or subject area.

Assessments can be further characterized as assessment *of* learning, assessment *for* learning, and assessment *as* learning. Diagnostic assessments represent a type of assessment that provides specific information on the reasons a student may be experiencing learning difficulties.

The key purpose of an assessment for students with special education needs is to ensure that they are provided with the most effective programming possible for accessing learning.

Educational Assessment

An educational assessment involves the use of a combination of tools to gather information about a student's academic functioning and, sometimes, overall cognitive abilities. It can provide diagnostic information with respect to how a student approaches tasks and utilizes learning strategies in the various strands or subject areas. Educational assessments are usually completed by members of the in-school team. An educational assessment can provide information for an Identification Placement Review Committee (IPRC) decision and/or for the development of an Individual Education Plan (IEP), but does not result in a diagnosis.

Psycho-educational Assessment

A psycho-educational assessment consists of a series of tests to evaluate a student's level and pattern of cognitive and academic functioning. It usually provides a detailed breakdown of cognitive processes. As psycho-educational assessments are completed by, or under the supervision of, a psychologist, they can result in a specific diagnosis, such as learning disability or developmental disability.

Evaluation

Evaluation refers to the process of judging the quality of student work on the basis of established criteria, and assigning a value to represent that quality. An effective evaluation should indicate a student's progress and thus serve as a "navigational marker" that allows a teacher to make more accurate instructional decisions.

Purposes of Assessment

The purposes basic to any assessment are to help:

- specify and verify problems;
- make accurate decisions about students' programs;
- make a range of decisions, such as referral decisions, screening decisions, classification decisions, instructional planning decisions, or progress decisions;
- determine requisite instruction;
- determine particular interventions that may be necessary for the students to gain access to opportunities for achieving desired outcomes.

The Process of Assessing

For any type of assessment, the process that most teachers follow, and which they feel they know intuitively, is as follows:

1. *Always* know the *purpose* for assessment.
2. Decide what *type of information* is needed.
   - Qualitative or subjective information can be broadly descriptive or context-specific.
   - Quantitative or more objective information includes retestable information.
3. Decide which assessment tool will best give the information required and who will need to conduct the assessment. School-based educators usually carry out measures such as curriculum-based assessment, interviews, observation, or criterion-referenced testing. Other professionals administer certain standardized tests and other clinical testing procedures.
4. Ensure that parents or guardians are actively involved or consulted at all stages.

Ample research (e.g., Resnick, 1994; Salvia & Ysseldyke, 2001) demonstrates that such a process provides the teacher with more accurate indicators for planning and for communication with parents and with other professionals.

Approaches to Assessment

A growing body of research focuses on the following three approaches to assessment:

Assessment *of* learning – often referred to as "evaluation" – is:

- connected to summative assessment (see p. 24);
- used for reporting achievement (grades);
- usually expressed in marks or letter grades;
- used for accountability.

Assessment *for* learning:

- is connected to formative assessment (see below);
- is interactive among participants;
- entails teachers giving quick feedback in terms that make sense to students;
- uses information to adjust plans and strategies – especially when modifying instruction and determining the accommodations that will be needed for the student to access learning.

Assessment *as* learning:

- is the most difficult yet the most important for a student with learning exceptionalities to grasp, because it is critical for independent progress;
- emphasizes the role of the student as the critical connector between assessment and learning;
- fosters self-monitoring through metacognition and the application of self-regulatory strategies (Earl, 2003).

Types of Assessments

Diagnostic assessment. This type of assessment, which provides teachers with *diagnostic information*, should be made whenever the need arises. It helps the teacher understand what a student brings to the classroom or to a specific subject.

In the course of gathering information on students from previous teachers, parents, and formal sources (such as the Ontario Student Record, or OSR), teachers develop a *baseline* of information upon which further assessment will take place as is necessary to create a *profile* of the class and of individual students' needs. If the teacher observes that individual students and groups of students within the classroom have significant skill deficits or unusually advanced skills, and if the OSR and these informal reports do not provide sufficient information to provide effective learning opportunities, then the teacher needs to consult with the in-school resource team. One outcome of the meeting could be consideration of a diagnostic assessment. For example, a student within a Junior Division classroom who exhibits significant deficits in sight vocabulary, and whose previous report cards indicate that he or she reads at an early primary level, might require a diagnostic assessment. The goal of the diagnostic assessment would be to provide more specific diagnostic information, such as whether the reading difficulties are related to, for example, phonemic awareness deficits, so that the teacher could provide targeted, and hence more effective, instruction.

Formative assessment. This type of assessment provides benchmarks for individual students and groups of students in order to confirm instructional practices or specific interventions made by the teacher. Based on these benchmarks, teachers can:

- perform a *gap analysis*, such as determining from running records that 12 of 22 students in a Grade 3 classroom lack prediction strategies when reading aloud;
- reflect on past practice; and
- begin to make decisions based on sound pedagogy for future instructional planning.

An important element of formative assessment is the provision for immediate and accurate feedback to students and their parents. It also encourages teachers to conference, when possible, with students to maximize their potential to achieve outcomes.

Summative assessment. This type of assessment generally occurs at the end of an instructional segment, module, unit, or term, and provides a fair and accurate reflection of what has been taught. When planning or developing a summative assessment, it is imperative that teachers examine the curricular elements that they have covered and assess only these elements. Teachers must also ensure a level playing field for all their students by giving consideration, where necessary, to providing additional time for students; providing different formats for assessing; ensuring that the language level of the assessment is similar to that used during the teaching; or providing "quiet space" for students.

Summative assessments provide teachers with baseline data for planning subsequent instructional segments. The results of summative assessments must be communicated clearly to students, parents, and other professionals. Reports on results should *explain* differences, not merely *describe* them. These explanations will assist the teacher in future grouping of students within classroom activities and when activities are provided for new instructional units, and will also support specific interventions where needed.

Assessment in the Classroom

The teacher identifies needs; adopts particular strategies and recommends interventions; evaluates the results; and reassesses the learning situation. The teacher can, however, enter the assessment process at any point depending on what is known or not known about a student. The classroom teacher can select among many tools or instruments to conduct assessments in order to greatly increase the accuracy of classroom observations.

The teacher's most important assessment strategy: Observation and analysis

Everything stems from clear and systematic observation within the classroom (e.g., are the skills consistently demonstrated? are inappropriate behaviours consistent? persistent? intense?). The teacher uses observation to maintain an awareness of the uniqueness that individual students bring to the classroom environment and to specific learning tasks. A good observation process allows the student to demonstrate capabilities within an inviting and engaging learning environment. Students should, for example, feel confident that they could demonstrate their knowledge without fear of repercussions from their peers.

How to maximize the success of observation in the classroom

- Observe students' learning in a continuous, systematic, planned, and open manner throughout the school year.
- Obtain descriptive information on a student's learning at a point in time that shows how the student is progressing towards a learning outcome or specific intervention.
- Communicate with the student to encourage him or her to take further risks in the classroom.
- Use observation to encourage greater time on-task, which correlates highly with achievement.
- Repeatedly observe a site-specific inappropriate behaviour or pattern of behaviour to determine whether or not it may be a barrier to learning.
- Determine whether the inappropriate behaviour occurs in a variety of learning settings (e.g., mathematics class at 9:20 a.m. compared with observations made in environmental studies class conducted after lunch).

Suggestions on how to record observations accurately

- Approach the student's learning of a task without bias in terms of personal perceptions of, or reactions to, possible inappropriate behaviours. The teacher needs to be specific and as objective – non-judgmental – as possible.
- Know what you want to observe, and design your own framework to maximize information that will help enhance student learning. Your observations should be factual, and include data that you can readily manage and use immediately after the observation period. Avoid trying to observe too many things at the same time.
- Set specific outcome targets in advance. For example, you may choose to observe the frequency of inattentive behaviour during a specific instructional segment of a lesson.
- Record observations of appropriate behaviours and learning skills and indicate "next steps" when possible.

Questions to consider when making observations of inappropriate behaviours

How often have I observed a particular behaviour?

Considerations: Frequency and consistency (e.g., of time and duration) can help a teacher determine how much of a barrier a particular off-task, inappropriate behaviour might be.

Do particular behaviours seem to occur randomly, or is there a pattern?

Considerations: Are the behaviours observed only during specific tasks or activities? Curriculum subjects? Times of day? Days of the week? A pattern of situation-specific observations is different from observations made across situations.

Are behaviours intense enough that they interfere with any (new) learning tasks?

Considerations: Children often demonstrate inappropriate behaviour when approaching new tasks. Those who have particular impairments to learning new things will take longer and may need more time to "catch on"; or they may need a different view of approaching the new task before they understand it.

Questions to consider when observing skills

Is there any correlation between observed classroom performance and other observational data (such as achievement on assignments, portfolios, or classroom tests, or a psycho-educational assessment)?

Considerations: If the information gleaned from different environments (e.g., classroom versus clinic) is similar, then a teacher will have support for particular interventions; when information is contrary, there is a need for constructive discussion between student and teacher.

Is the language used in my assessment of learning commensurate with the language level of the student and does it parallel the language I use in my teaching?

Considerations: Evaluation of abilities can be biased if there are differences in the levels and types of language used between instruction and assessment (see Resnick & Resnick, 1989).

Developing a detailed picture of a student's strengths and needs

Eventually, the teacher should be able to attain a detailed picture of the student's strengths and needs from observational data and information from clinical reports, if available and applicable. Ideally, teachers can check their observational data against information gathered from other sources to confirm patterns revealed by observation and assessment. They can then further investigate discrepancies, and call in other experts, as needed.

Teacher Conferences

Observations made and data recorded in any one classroom may be specific to that situation or may apply across contexts. It is essential that teachers share ideas and confer with their students, their parents and guardians, and other teachers and professionals, not only about specific observations but also about their implications for instruction and interventions (see Gaddy, Dean, & Kendall, 2002, for more details). Assessment is thus a team approach that respects all partners in the process. The following components are important for any successful teacher-led conference:

- Engage the student as soon as possible after you make your observations.
- Be positive – relay a sense of optimism and enthusiasm for learning.
- Be reassuring.
- Be accurate in your descriptions.
- Be interactive so that the student can express his or her perspective and engage you in what he or she is doing.

- Assist the student in setting achievable goals.
- When appropriate, offer specific strategies or remediations.
- Using baseline data, set directions for future steps to be taken that confirm the student's strengths; in other words, select a strategy or resource already in the student's repertoire.
- Use a variety of question and discussion techniques to encourage interaction.
- Make the conference an opportunity for developing a student's self-understanding, which will lead to greater independence.

The In-School Support Team[2]

The in-school team is the "front line" of support for the classroom teacher. It may include the parents of the student, and may include the special education support teacher, subject leader, and/or school principal. This group should be informal and collegial. It can provide valuable insights into possible interventions, and should help pose questions that support the existing situation and actions taken.

In-school teams play a significant role in helping classroom teachers address difficulties that a student may be experiencing in the classroom prior to, and after, formal assessment and identification. They are made up of people with various types of expertise who work together to:

- support the student and the parent;
- collaborate, consult, and share information and knowledge to identify strategies that may increase the student's learning success.

The active involvement of parents enhances the effectiveness of the in-school team. Parents and students have important information to share with members of the team and should be invited to meet with the team when necessary and appropriate. The support of parents has positive and pervasive effects on the child's success in school, and parents should be encouraged to feel that their contribution is a valuable part of the school-team process.

Based on the information gathered by the classroom teacher at the initial stage, members of the in-school team can suggest and assist in further assessments that may get to the root of a particular child's learning needs. Other members of the team can assist in information gathering by conducting an educational assessment.

The Out-of-School Support Team

The school-based professionals may have done all they can to understand and address the student's strengths and needs, but they may determine that the teacher still requires outside advice and, possibly, support from specialist professionals and community agencies. Reports from specialists provide additional information for the in-school team.

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[2] Much of this section is drawn from *Special Education: A Guide for Educators* (Ontario Ministry of Education, 2001), "Section C: Program Planning", pp. C6–C11, which describes in some detail the opportunities and processes of a school team.

The Psycho-educational Report

In developing an Individual Education Plan (IEP), the psycho-educational assessment and report is the most common out-of-school report that a teacher will encounter. The psycho-educational report has two primary purposes:

1. To provide specific information on aspects of a child's functioning, such as level and pattern of cognitive abilities, academic achievement, and behavioural and social-emotional function.
2. To provide recommendations, based on assessment results, that lead to specific programming. These recommendations may include accommodations and modifications.

Psycho-educational reports delineate the cognitive processes and other factors that may be interfering with the student's learning. They usually refer to and discuss general learning processes and behaviours using specific clinical terms. These terms are important for teachers to understand because they often relate to or explain behaviours that teachers are observing in classrooms.

Different psycho-educational reports may incorporate different measures, but all will, in general, include valid and reliable measures of processes that have been found to have a major impact on learning.

Reassessment

The ultimate goal of a learning profile (see Chapter 4) is to guide appropriate instruction. But teachers need to be aware that a learning profile is a moving target. Although the child's actual cognitive profile is relatively stable, his or her achievement will change over time. For example, the student will acquire new knowledge and skills, or may develop compensatory strengths that allow him or her to respond to teaching in new ways. Additionally, the demands of reading, writing, and mathematics change over the primary and junior grades, and these changes may make varying demands on the student.

Whether or not a student has been "identified" as exceptional, is on a modified program, uses specialized equipment, or requires specific, clinical interventions outside of school, reassessment cannot be overlooked. Reassessment is crucial to assisting the classroom teacher in evaluating progress, in providing information whenever a student's program is reviewed, and especially in ensuring "navigation markers" in the constantly-changing sea of a child's learning environment.

Table 2. Questions About Information in the Psycho-educational Report

Teachers may want to ask the psychologist or other educational team members some of these questions about the information provided in the psycho-educational report:

What does the report say about the achievement level of the student in literacy and numeracy relative to his or her age or grade placement?

Are there specific patterns of strengths and weaknesses within each subject area? For example, in reading, what is the level of word decoding, reading fluency, listening comprehension, and reading comprehension? In math, what is the level of computational skills, geometry, and problem solving?

Does the report provide information about strengths and difficulties in cognitive skills and abilities that can facilitate or impede learning? For example, does the report discuss the student's memory skills, processing speed, attention?

Factors such as these can have an impact on the student's learning and on the types of modifications and accommodations that may need to be put into place. (The possible learning-related consequences of difficulties in these areas is elaborated in Table 3, How Cognitive Processes Affect Learning, in Chapter 4.)

When there are inconsistencies between what I observe in the classroom and the information provided by the report, what is the next step?

This situation requires further meetings and consultations among all educational partners. Follow-up observations in the classroom may be considered.

If information regarding social/emotional functioning is provided in the report or through consultation, then what is the impact on student learning?

Performance on a clinical assessment has important implications for in-class productivity. For example, the clinical report may provide information about factors such as anxiety, impulsivity, or depression. If any of these exist, they may affect a student's functioning in the classroom across content domains, and require consultation with the school-based team to determine programming to support the student's learning.

4

Developing Learning Profiles: Know Your Students

For the classroom teacher, who is responsible for meeting the learning needs of his or her students, effective instruction begins with an understanding of the needs of the learners, both collectively as a classroom unit and as individual students. If a child is demonstrating difficulties in school, it is important to identify the causes and take appropriate steps to alleviate them.

Once a teacher knows the dynamics of the classroom and the individual student profiles that support those dynamics, the teacher can select effective teaching and learning strategies and interventions to maximize student achievement. Classroom and individual student learning profiles are informative and insightful for this purpose.

Some district school boards may have already developed charts and diagrams that can be used to generate class and individual learning profiles. Some examples of charts used to record information are given in the appendices at the end of this chapter.

Components of a class profile

All of the following information is necessary to establish the classroom profile and to determine each student's individual learning profile:

Academic information – literacy and numeracy. This includes taking a "snapshot" of all the students in the class and identifying their level of performance in literacy and numeracy. This information will be useful for planning instructional strategies and targeting goals.

Educational history. This includes the identification of the particular needs of students, consulting each student's educational record, reading assessment reports or previous Individual Education Plans (IEPs), and becoming familiar with academic, psychological, or educational assessments. This information will help the teacher provide the kinds of learning supports that have been used successfully with that student in previous years.

Socio-affective information. This includes the identification of affective, social, and personal development. Parents have an important role to play in this part of the profile. They know their child, and are essential partners in their child's success. This information will be helpful for devising successful groups for collaborative learning projects.

Why Develop a Class Profile?

The teacher establishes a class profile first and foremost to collectively identify the strengths, challenges, and needs of all students and to determine the stage that each student has reached in his or her learning.

Setting up a class profile is the first step in planning the teaching and the pedagogical intervention strategies for a given classroom. The teacher develops the class profile using an assessment of the students' academic achievement in literacy and numeracy. In addition, because the class profile has an impact on all areas, the teacher does not limit it to the students' academic level. It is also intended to identify:

- students' socio-affective development;
- their interests and talents;
- their current place in the learning process;
- their perceptions about their learning; and
- any details that parents have observed about their children.

The class profile provides the teacher with the necessary elements for modifying the curriculum for individual students and making appropriate accommodations; for differentiating his or her teaching; for planning significant projects; and for meeting the personal needs of each student. It is a basis for planning centred on the strengths, challenges, individual characteristics, and similarities that the students share in the classroom. Armed with all of this information, the teacher can then help the students to work together and cooperate with one another.

The teacher should develop the initial class profile at the beginning of the school year. She or he can draw from student profiles, which are also being drawn up in September by teachers, students, and parents. The teacher can then take all the information that has been provided and develop an educational plan.

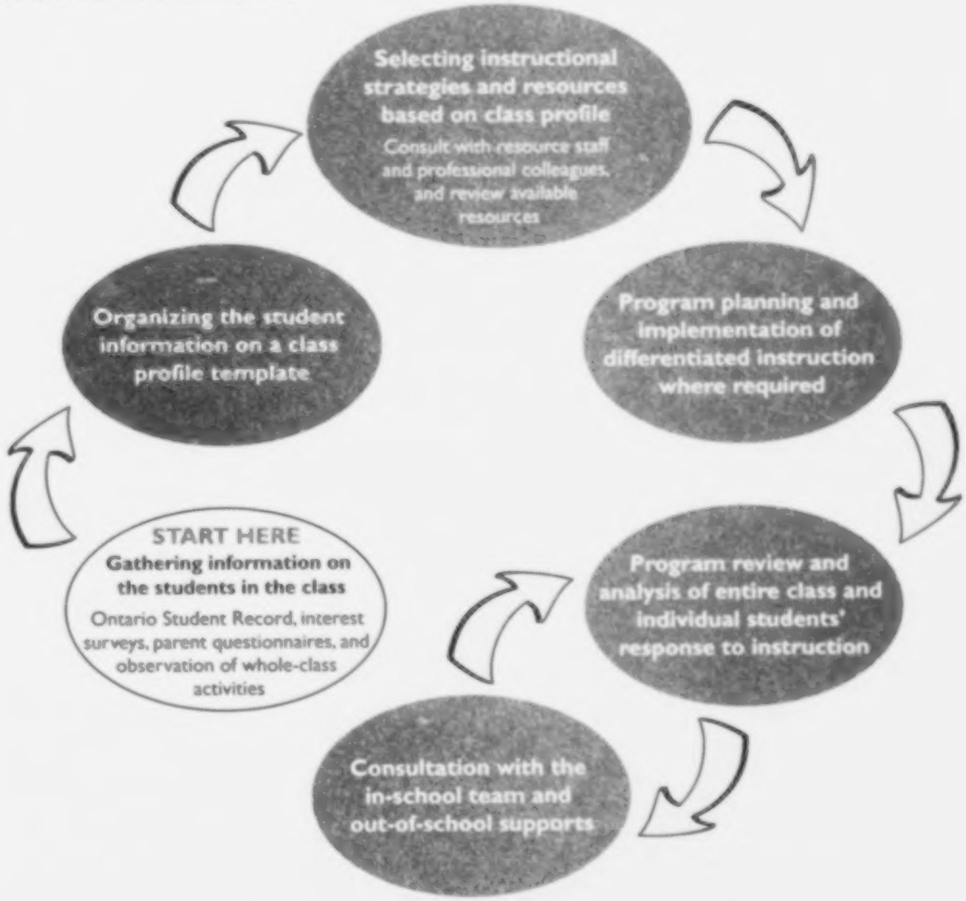
Critical Steps in the Development of a Class Profile

1. **Gathering information on students.** The teacher develops his or her class profile using parent and student questionnaires. In addition, the teacher selects and analyses numeracy and literacy activities, and makes diagnostic assessments of student achievement. The teacher may add data kept in each student's school record to the profile.
2. **Organizing the student information.** The teacher summarizes strengths and areas of need related to literacy, numeracy, and social-behavioural issues, along with the programming implications (see Appendix 4-1).
3. **Selecting instructional strategies and resources based on the class profile.** The teacher identifies the strengths, needs, similar challenges, and interests of the students in the class. The teacher begins to identify those students who will benefit from similar modifications of the learning program, similar accommodations to the teaching, or similar interest-based topics.
4. **Program planning and the implementation of universal design and differentiated instruction.** The teacher considers the curriculum, the instructional strategies selected,

the patterns in the class, and individual student profiles, and plans in light of these factors. The principles of universal design ensure that planning is flexible, supportive, and adjustable, and increases access to the curriculum by all students. The teacher identifies how he or she will modify curriculum expectations for individual students, provide appropriate accommodations, and select effective instructional approaches.

5. **Program review and diagnosis of whole-class and individual student responses.** The teacher takes into account the specific needs and strengths of all of the students, including those with special needs. Students learning should be monitored carefully so that the teacher is aware of each student's response to specific instructional strategies and to the overall learning environment. As the teacher collects evidence of skill and knowledge acquisition by students, the efficacy of instructional strategies can be reviewed and teacher planning revised accordingly.
6. **Consultation with the in-school team and out-of-school supports.** Keeping in mind that strategies require adequate investment of time and persistence before a decision can be made about their effectiveness, the teacher may decide to seek further assistance regarding some students from the in-school team and out-of-school supports. The teacher works in collaboration with the in-school team to review the effectiveness of teaching strategies selected and/or to incorporate the recommendations made by out-of-school professionals.

Figure 4. Class Profile Flowchart


START HERE
Gathering information on the students in the class
Ontario Student Record, interest surveys, parent questionnaires, and observation of whole-class activities
Organizing the student information on a class profile template
Selecting instructional strategies and resources based on class profile
Consult with resource staff and professional colleagues, and review available resources
Program planning and implementation of differentiated instruction where required
Program review and analysis of entire class and individual students' response to instruction
Consultation with the in-school team and out-of-school supports

Why Develop an Individual Learning Profile?

Classroom teachers may suspect that a student has special needs and choose to develop an individual learning profile for many reasons. They may have previously acquired information about the history of a student's academic progress, or may be the first person to suspect that a student has special needs. They may observe that a student is experiencing particular difficulties with aspects of the curriculum and thus may wish to develop a more comprehensive picture of this student across all academic domains. They may also note that the student is exhibiting general behaviour problems such as poor attention to details, difficulty organizing work, and concentration problems. These behavioural difficulties have major implications for a student's academic success (DuPaul et al., 2004; McGee, Piror, Williams, Smart, & Sanson, 2002; Rabiner & Coie, 2000; Todd et al., 2002).

Steps in Creating an Individual Learning Profile

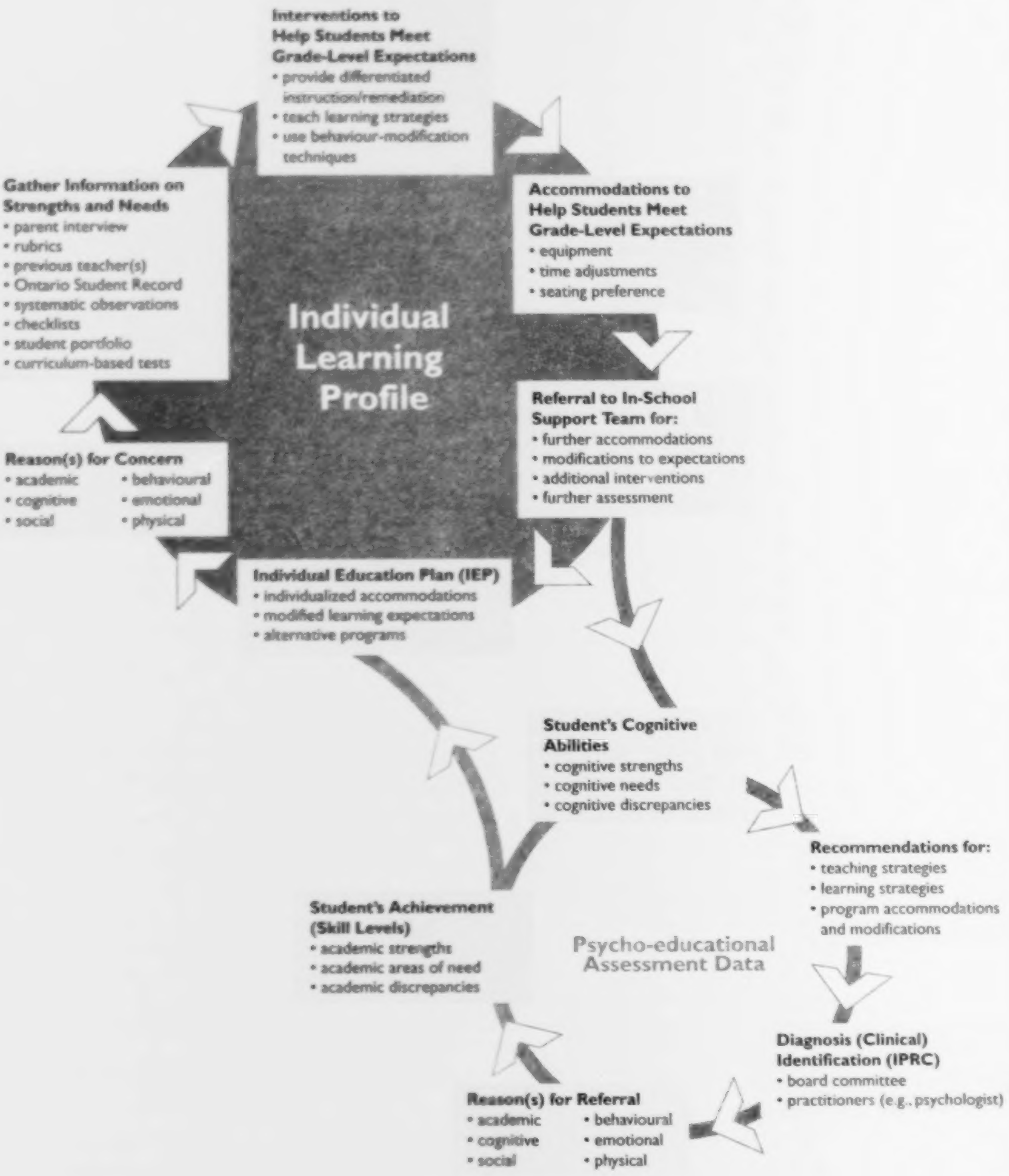
In response to a concern about a particular student's academic and/or behavioural difficulties, the teacher can create a learning profile focusing specifically on that student (see Appendix 4-2). This learning profile draws on a range of information sources such as:

- information from the Ontario Student Record;
- data gathered from parents, caregivers, and previous teachers;
- observations of a student's literacy and numeracy skills and general learning behaviours;
- data from criterion-referenced assessment tools such as curriculum-based measures, reading inventories, work samples/portfolios, and tests. Some useful assessment instruments can be found in the Ministry of Education's guides to effective instruction in reading and math (Ontario Ministry of Education, 2003a, 2003b), while others are available through other sources (e.g., Learning Disabilities Association of Ontario (LDAO) early assessment for reading; Paris, 2003);
- psycho-educational reports, speech/language reports, diagnostic assessment data, medical reports, and so forth.

After completing the data-gathering process, the teacher designs instruction for the student that takes into account the particular needs of the student and capitalizes on his or her strengths. One of the key pieces of information to be derived from the individual learning profile is the student's current instructional level in the area(s) of difficulty. On the basis of this information, the teacher can provide instruction that directly targets the critical skills that the student needs. Essentially, the learning profile performs a "gap analysis" to determine where the child's abilities are relative to the age-appropriate stage of development.

There is considerable overlap between the steps in creating what we refer to in this report as an individual learning profile and the process for developing an Individual Education Plan (IEP) for a student. The information gathered for a student's individual learning profile would likely become an important resource for the IEP development team. More detailed information on the development of an IEP can be found in *The Individual Education Plan (IEP): A Resource Guide* (Ontario Ministry of Education, 2004b).

Figure 5. Individual Learning Profile Flowchart


Individual Learning Profile
Interventions to Help Students Meet Grade-Level Expectations
• provide differentiated instruction/remediation
• teach learning strategies
• use behaviour-modification techniques
Accommodations to Help Students Meet Grade-Level Expectations
• equipment
• time adjustments
• seating preference
Referral to In-School Support Team for:
• further accommodations
• modifications to expectations
• additional interventions
• further assessment
Individual Education Plan (IEP)
• individualized accommodations
• modified learning expectations
• alternative programs
Reason(s) for Concern
• academic
• cognitive
• social
• behavioural
• emotional
• physical
Gather Information on Strengths and Needs
• parent interview
• rubrics
• previous teacher(s)
• Ontario Student Record
• systematic observations
• checklists
• student portfolio
• curriculum-based tests
Student's Cognitive Abilities
• cognitive strengths
• cognitive needs
• cognitive discrepancies
Recommendations for:
• teaching strategies
• learning strategies
• program accommodations and modifications
Psycho-educational Assessment Data
Diagnosis (Clinical) Identification (IPRC)
• board committee
• practitioners (e.g., psychologist)
Reason(s) for Referral
• academic
• cognitive
• social
• behavioural
• emotional
• physical
Student's Achievement (Skill Levels)
• academic strengths
• academic areas of need
• academic discrepancies

Relationship Between Inattention and Academic Achievement

Research has shown that children with persistent behavioural difficulties, such as attention-deficit hyperactivity disorder (ADHD), are at considerable risk for academic underachievement (DuPaul et al., 2004; Hinshaw, 1992). Moreover, research strongly suggests that inattention symptoms, such as forgetfulness, tendency to lose things, difficulty staying on task – but *not* the symptoms of hyperactivity-impulsivity, such as restlessness and fidgetiness – are strongly associated with academic underachievement (Graetz, Sawyer, Hazell, Arney, & Baghurst, 2001; Merrill & Tymms, 2001; Rabiner & Coie, 2000; Todd et al., 2002).

Children with ADHD will need interventions that *address both their behavioural problems and their academic weaknesses.*

Many children with ADHD also have specific learning disorders in reading and/or mathematics (Tannock & Brown, 2000). For example, research has shown that between 15 and 40 per cent of children with ADHD also have reading disabilities. Moreover, research has also shown that children with reading disorder and ADHD exhibit the cognitive weaknesses associated with each disorder (Willcutt et al., 2001; Willcutt et al., in press). In other words, a child with co-occurring reading disorder and ADHD will have significant linguistic weaknesses (e.g., poor phonological processing abilities) and will exhibit the executive function weaknesses associated with ADHD (Barkley, 1997).

In addition, research has shown that young children (in Kindergarten and Grade 1) with high levels of inattention symptoms are also at significant risk for academic underachievement in reading and mathematics (Merrill & Tymms, 2001; Rabiner & Coie, 2000; Rabiner, Malone, & Conduct Problems Prevention Group, 2004). For example, Rabiner and Coie found that children who were rated in Kindergarten as exhibiting attention problems were more likely than children without attention problems to exhibit weaknesses in reading in Grade 5 even after controlling for levels of hyperactivity, anxiety, other behaviour problems, and prior reading achievement. Hence, children who are inattentive in the early grades may be at particular risk for failing to develop critical reading skills even when they enter Kindergarten with relatively age-appropriate reading abilities (Rabiner & Coie; Rabiner et al.).

Using a Psycho-educational Assessment to Develop an Individual Learning Profile

The Expert Panel recognizes that knowledge about a student's strengths and weaknesses in cognitive processing helps teachers provide appropriate instruction and accommodations for children in their classrooms. These instructional supports ensure equal access to instructional content for all children, particularly those with special education needs.

Table 3 describes processing characteristics related to learning and how weaknesses in those processes can lead to difficulties in literacy and numeracy. It also identifies sections of this report that provide possible instructional strategies for students with weaknesses in these cognitive processes. It is worth noting that many children with special needs will have difficulties in more than one of these aspects of cognitive processing. Furthermore, some of these cognitive processes are interrelated.

Information about cognitive profiles may come from psychological reports and other professional reports, and may be supported by information that a classroom teacher has collected in assessment and observation of students. All academic and cognitive recommendations that relate to the student's program should be considered by the classroom teacher when generating an individual student profile.

Table 3. How Cognitive Processes Affect Learning

What cognitive processes affect children's learning?	What are the consequences of weaknesses in these processes?	How can we address these weaknesses in the classroom?
Slow Information Processing		
Many children with exceptionalities are slow in processing information. In general, they may have difficulty keeping up with the pace of language spoken and instructions delivered in the classroom. They may be slow at reading words and text. Their basic arithmetic skills may lack fluency. They may take more time than expected to copy information from the board or a book, and their written work may be laborious.	**The effects when reading is slow.** Slow reading can affect comprehension because the ability to integrate information between different parts of a sentence, paragraph, or larger chunk of text is necessary for understanding what is read. By the time a slow reader gets to the end of a paragraph, he or she may have forgotten what was read earlier in the paragraph, making integration between and among all the parts of the material difficult (see Lyon, Fletcher, & Barnes, 2003). Young children who have difficulty decoding words and who are consequently slow readers may, with appropriate interventions, become quite accurate at reading words. However, these children may continue to have problems with reading fluency (Torgesen et al., 2001).	• Use assistive technology to help students with decoding difficulties comprehend text (see p. 130). • Provide opportunities to build fluency (see p. 101).
	The effects when basic arithmetic is slow. Slow processing speed of basic arithmetic can affect higher-level math computations and problem solving (Geary, 2003). When children begin to compute, they use a variety of developmentally appropriate strategies such as counting on their fingers or counting verbally. With practice, the child comes to "know" the answer to single-digit arithmetic such as 3+4 without having to constantly compute the answer. Children who have difficulties in math may struggle with this very basic level of arithmetic and continue to use slower counting strategies to ensure accuracy at the single-digit level. Difficulties with fluency of basic arithmetic leave these children with fewer cognitive resources to devote to calculating solutions to multi-digit problems or to other types of math problem solving.	• Use assistive technology such as calculators (see p. 135).
	The effects when writing is slow. Slow writing affects the quality as well as the quantity of written compositions (Berninger & Amtmann, 2003). Slow printing and slow writing take time and cognitive resources away from forming the ideas and composing the language needed to communicate through writing. Children who are slow writers will write less, and their written work may be of reduced quality in terms of language expression and content.	• Use assistive technology (see p. 131). • Provide more time to complete assignments where necessary. • Provide students with a scribe.

	Slow visual-motor skills and slow printing or writing can also affect the ease with which children can copy work from the blackboard or a book. Essentially, the child may devote less time on the goal of the activity – answering the questions or solving the problems – because he or she is spending most of his or her time copying questions or problems. Less opportunity to spend time working with core academic content through problem solving and question answering may further compound the learning difficulties of the child with special needs.	• Provide students with templates to complete rather than have them copy from the board or a book (see Mind Mapping, p. 88).
Language		
Some children with special needs have difficulties in understanding and using language. This may be due to developmental problems in language processing despite adequate exposure to language, or from a lack of exposure to adequate language input. Language difficulties can involve lack of vocabulary and syntactic knowledge, and/or difficulties with discourse skills such as inference making and understanding non-literal language.	**Effects on literacy.** Children who have difficulties understanding spoken language will have similar difficulties in understanding what they read (Lyon et al., 2003), and in written expression. So, if a child has difficulty making inferences in oral language, he or she will have similar problems with inference and linking different parts of a text when he or she is reading. Problems in reading comprehension mean that the child may be less able than other students to gain new knowledge from what he or she is reading across a variety of content areas or academic subjects. **Effects on numeracy.** Children who have difficulties in language may also have difficulties in those aspects of mathematics that involve language processing such as solving math word problems (Jordan & Hanich, 2000), and in mathematics vocabulary such as quantitative terms (e.g., more, less), labels (e.g., names of shapes), and measurement terms (e.g., terms for length, volume, distance). These children may also have difficulty *communicating* their understanding of mathematics regardless of whether language is needed to solve particular math problems. **Effects on general classroom functioning.** Children who have problems understanding language may have difficulties in following classroom instructions whether they are delivered orally or in writing. They may miss the nuances of language such as metaphors and idiomatic language that teachers often use to enrich the language of the classroom (e.g., "You all have to be on your toes now."). They may misinterpret the language of the playground, which is also not always literal (what is said is not always what is meant).	• Before listening or reading activities, highlight key aspects of language and new vocabulary (see pp. 95–96). • Help students make links between prior and new knowledge (see p. 98). • Provide visual supports (see pp. 96–97). • Use contexts students are familiar with (see p. 79). • Provide prompts or sentence starters to help students share math solutions or strategies (see p. 80). • For other instructional strategies see pp. 62–65, 86–87.

(continued)

Table 3. How Cognitive Processes Affect Learning (continued)

What cognitive processes affect children's learning?	What are the consequences of weaknesses in these processes?	How can we address these weaknesses in the classroom?
Prior Knowledge		
The knowledge about the world that children bring into the classroom is a strong determinant of their learning across a number of content areas. Children who have a solid knowledge base in a particular area are better able to understand what they hear and read on that topic, are better able to link old knowledge with new information to produce new learning, and are better able to use strategies to remember what they have learned (Bjorklund, 2005). Children can differ in their prior knowledge for a variety of reasons (e.g., a child may be a new Canadian or come from a different cultural background). What is important to keep in mind is that general knowledge important for new learning may need to be restated and reinforced for some children and actually taught to others.	**Effects on literacy.** Children enter school with different knowledge about letters and letter sounds. This knowledge is strongly related to learning how to read (Share & Leikin, 2004). Children who enter school without this knowledge may be less able to take advantage of early literacy instruction. The teacher will need to address this knowledge gap. Understanding what is read requires that a student's knowledge be integrated with what is explicitly said in the text. Students who lack world knowledge important for fully understanding a particular text will learn less from what they read and remember less. In these cases, teachers will need to address these gaps in background knowledge. **Effects on numeracy.** More than any other content area, learning in mathematics builds on mastery of prerequisite skills learned at an earlier point. Children will have difficulty learning a new mathematical skill if they lack mastery of the prerequisite skills. Children enter school with different knowledge about numbers, counting, quantities, shapes, and other mathematical and math-related skills (Klein & Starkey, 2004). In order to take advantage of the early math curriculum, teachers will need to address these early prerequisite skills.	• Provide explicit instruction in phonological awareness, letter-sounds, and letters (see p. 102). • Preteach vocabulary and structure activities so that students' background knowledge is activated (see p. 98). • Build upon current knowledge (see p. 78). • Use PALS to scaffold learning (see pp. 68, 81). • Refer students to word wall or math strategy wall to reinforce previous learning (see p. 89).
Memory		
Many children with special needs have difficulties with various aspects of memory. Some children, for instance, have problems retaining what they have learned. Children can vary in their ability to efficiently encode and/or retrieve information from long-term memory (Cutting, Koth, Mahone, & Denckla, 2003).	**Effects on literacy and numeracy.** Regardless of the origin of difficulties in retention and recall of new learning, children who have difficulties with longer-term retention of new learning will show inconsistent performance; they may show evidence of learning at one point in time or in a particular context, but seem to have forgotten what they have learned when assessed at another point in time or in a different context. This type of pattern is often a good indicator that the child requires longer duration and greater intensity of instruction in	• Provide students with concrete representations of key steps (see pp. 78–79). • Use manipulatives or diagrams (see pp. 74, 86).

The most common memory difficulty experienced by children with special needs is in what is called *working memory* (Siegel, 1994). Working memory refers to a "mental workspace" in which the student can store and manipulate information for brief periods of time in order to perform another cognitive activity. When working memory is limited, the student will have difficulty keeping in mind multiple pieces of information while carrying out a task. He or she may not be able to carry out the task or monitor performance for errors.

Working memory plays a role in a range of academic activities such as mental calculation, math problem solving, language and reading comprehension, and writing (Baddeley, Emslie, Kolodny, & Duncan, 1998; Bull & Scerif, 2001; Daneman & Carpenter, 1980; Gathercole & Pickering, 2000; Swanson, 1999).

In some cases, what may appear to be difficulties in memory consolidation or long-term retention may not be a memory problem at all, but may reflect lack of prior knowledge such that new learning cannot be integrated into a pre-existing knowledge base and is therefore easily forgotten. Difficulties in long-term retention may also reflect incomplete learning of new concepts, which makes these concepts vulnerable to forgetting. Or such difficulties may reflect insufficient practice with new concepts and skills, which is what consolidates new learning in memory.

the skill that seems prone to forgetting and inconsistency in performance across time and contexts.

Effects on literacy. In reading, the ability to integrate one sentence with another requires the ability to remember the previous sentence as the next sentence is being processed. So working memory difficulties may interfere with a student's ability to put ideas together as he or she is reading.

In writing, working memory difficulties can interfere with the ability to plan, organize, and generate text (Swanson & Berninger, 1996). When writing a text, the student must hold in mind information related to what to write (ideas, words, sentences), how to write it (grammar, syntax, mechanics), and who the audience will be (style, text structure). Juggling these diverse task demands places a high load on working memory.

Effects on numeracy. Problems with working memory capacity can result in the use of less efficient strategies for solving computation and/or math problems (Geary, Hoard, Byrd-Craven, & DeSoto, 2004; Steel & Funnel, 2001; Swanson, 2004). For example, when a student performs mental addition, he or she must be able to store the numbers as well as perform the manipulations (i.e., adding the numbers) needed to compute the solution.

Effects on classroom behaviours. Children who have working memory difficulties may seem inattentive in the classroom and they may miss instructions, remembering only the first or the last thing you said.

- Provide instruction that is more focused and/or of longer duration, and provide more instructional supports (see p. 93).
- Use visual or graphic organizers to help students see connections among ideas and concepts (see p. 98).
- Provide students with concrete planning templates and self-monitoring checklists to guide actions (see pp. 108–109).
- Use visual prompts and model efficient problem-solving strategies (see pp. 78, 87).
- Provide students with concrete materials to assist with problem solving (see p. 87).
- Provide visual clues for verbal instructions.
- Provide instructions one step at a time, and check for understanding.

(continued)

Table 3. How Cognitive Processes Affect Learning (continued)

What cognitive processes affect children's learning?	**What are the consequences of weaknesses in these processes?**	**How can we address these weaknesses in the classroom?**
Self-Regulation and Executive Function		
A child's ability to exhibit *self-regulatory behaviours* is an important component of academic success (Zimmerman, 2000). Self-regulatory behaviours or executive functions are those cognitive processes that support strategic and goal-oriented behaviour. These cognitive processes can include both cognitive control functions (e.g., planning, organizing, monitoring) and emotional control (regulating emotional responses) (Gioia & Isquith, 2004).	**Effects on classroom behaviours.** Many academic tasks or instructional contexts require a child to exhibit self-regulatory behaviours. For example, in the classroom children frequently need to: • exhibit task persistence; • solve novel problems; • integrate new knowledge with prior knowledge; and • set goals and monitor progress. (Barkley, 1997; Neitzel & Stright, 2003; Welsh, 2002)	• Model or use think-alouds to help students reason through a process (see p. 81). • Provide a step-by-step checklist of key actions to take (see pp. 79, 99). • Provide examples of finished work as a guide (see p. 89). • Teach strategies such as KWL to help students integrate new knowledge with prior knowledge (see p. 98).

4-1A. Classroom Profile: Socio-Affective

Personal Information

Group Qualities

Qualities of Certain Students

Tastes and Interests

Emotions and Perceptions

Work Habits/Social Skills

(e.g., cooperation with others, class participation, observation of the school's code of conduct, independence in work, handing in assignments and homework, problem-solving ability, sense of initiative, ability to set work improvement objectives)

4-1B. Classroom Profile: Literacy

1. What are my students' strengths? What interests or abilities could be used to encourage the students to make more progress in their language learning or learning of cognitive processes? What categories are affected? Knowledge and Understanding (KU), Thinking (T), Communication (C), Application (A)	**2.** What are the greatest challenges for the students in my class? What knowledge and skills give them the most trouble? What categories are affected? Knowledge and Understanding (KU), Thinking (T), Communication (C), Application (A)	**3.** What factors (e.g., language level, learning disabilities, attitudes) should I take into account in order to have an accurate description of the class?
Oral Communication	Oral Communication	Factors common to the class
Reading	Reading	Factors common to certain students
Writing	Writing	

4. Can I divide these students into groupings of different skills based on their knowledge and skills and the specific strategies I plan to use?	**5.** Which teaching strategies have I already found to be effective with these students? What other teaching strategies should I use based on the strengths and challenges of the group of students?	**6.** Do the group's results indicate any characteristics common to all three strands: reading, writing, and oral communication?
Oral Communication	Oral Communication	
Reading	Reading	
Writing	Writing	

4-1C. Classroom Profile: Mathematics

1. In which abilities do the students show their strengths? What interests or skills could be used to encourage the students to make progress in their learning of math and/or their cognitive processes?	**2.** What are the greatest challenges for the students in my class? Which skills present the most difficulty?	**3.** What factors must I take into account to arrive at a true portrait of the group of students (e.g., learning difficulties, knowledge of the language, reading level, attitudes)?
Knowledge and Understanding	Knowledge and Understanding	Factors shared by the class group
Thinking	Thinking	
Communication	Communication	Factors shared by certain students
Application	Application	

4. Are groupings possible, taking into account the students' abilities, understanding of concepts, and math skills?	**5.** What pedagogical strategies used to make the diagnosis could be used even more to develop the students' skills? What other strategies should I use?	**6.** Could I make links between the various math skills and between the different areas of math?
Knowledge and Understanding	Knowledge and Understanding	
Thinking	Thinking	
Communication	Communication	
Application	Application	

Appendix 4-2. Individual Learning Profile Templates

4-2A. Oral Communication

Student's name: ____________________

Knowledge and Understanding

Demonstrates knowledge of content	Demonstrates understanding of concepts, ideas, and opinions	Demonstrates understanding of relationships among facts	Demonstrates understanding of relationships among concepts and themes	Demonstrates understanding of the uses of literary devices

Thinking

Generates ideas	Organizes thinking	Analyses information	Integrates new vocabulary and information	Forms conclusions	Uses critical and creative thinking processes

Communication

Expresses ideas clearly	Expresses ideas with logical organization	Communicates effectively to different audiences	Communicates effectively for different purposes	Uses conventions for conversation	Uses effective vocabulary

Application

Applies knowledge and skills in familiar contexts	Transfers knowledge and skills to new contexts	Makes connections between oral language and reading and writing	Makes connections between prior and new knowledge	Makes connections between oral communication and other subject areas	Makes connections between oral communication and the world outside school

4-2B. Reading

Student's name: ______________________________

Knowledge and Understanding

Demonstrates knowledge of the forms of text	Uses a variety of reading strategies	Demonstrates understanding of concepts, ideas, and opinions	Demonstrates understanding of relationships among facts	Demonstrates understanding of relationships among concepts and themes	Demonstrates understanding of the uses of literary devices

Thinking

Generates ideas	Organizes thinking	Analyses information	Integrates new vocabulary and information	Forms conclusions	Uses a reading process

Communication

Responds to reading by expressing ideas clearly	Responds to reading by expressing ideas with logical organization	Communicates effectively to different audiences	Uses language conventions, such as punctuation, to improve fluency in oral reading.	Uses new vocabulary orally and in written forms	Uses reading terminology

Application

Applies reading strategies in familiar contexts	Applies reading strategies to new contexts	Makes connections between reading, writing, and oral communication	Makes connections between reading and other subject areas	Makes connections between reading and the world outside school

4-2C. Writing

Student's name: ______________________________

Knowledge and Understanding

Demonstrates knowledge of the forms of text	Demonstrates knowledge of the writing process	Uses a variety of writing strategies	Demonstrates knowledge of a variety of writing styles	Demonstrates understanding of the use of different writing styles	Demonstrates understanding of the uses of literary devices

Thinking

Generates ideas	Organizes thinking	Carries out a plan	Uses the writing process	Integrates new vocabulary and information	Forms conclusions

Communication

Expresses ideas clearly	Expresses ideas with logical organization	Communicates effectively to different audiences	Uses conventions for grammar, spelling, and punctuation	Uses new vocabulary	Uses writing terminology

Application

Applies writing strategies in familiar contexts	Applies writing strategies to new contexts	Makes connections between writing, reading, and oral communication	Makes connections between writing and other subject areas	Makes connections between writing and the world outside school

4-2D. Mathematics

Student's name: ______________________________

Knowledge and Understanding

Retrieves facts automatically	Uses math terms appropriately	Uses procedures appropriately	Uses manipulatives or concrete materials and other tools effectively	Demonstrates understanding of math concepts

Thinking

Identifies the problem to solve	Selects an approach for solving a problem	Carries out a plan	Evaluates the solution	Makes convincing arguments	Uses critical and creative thinking processes

Communication

Expresses understanding orally	Expresses understanding pictorially	Expresses understanding with manipulatives or concrete materials	Expresses understanding in writing	Communicates for different audiences and purposes effectively	Uses conventions, vocabulary, and terminology effectively

Application

Applies knowledge and skills in familiar contexts	Applies knowledge and skills to new contexts	Makes connections between concepts within mathematics	Makes connections between prior and new knowledge	Makes connections between mathematics and other subject areas	Makes connections between mathematics and the world outside school

5

Professional Learning Communities

> *"The term* ***professional learning community*** *refers to a way of operating that emphasizes the importance of nurturing and celebrating the work of each individual staff person and of supporting the collective engagement of staff in such activities as the development of a shared vision of schooling and learning, capacity building, problem identification, learning, and problem resolution. It is an environment in which staff can learn continuously and continually increase their ability to create the environment they desire.*
>
> *"A professional learning community is exemplified by collaborative work that is grounded in reflective dialogue, in which staff have conversations about students, teaching, and learning, identifying related issues and problems and debating strategies that could bring about real change in the organizational culture."*
>
> *(Ontario Ministry of Education, in press)*

The term *professional learning community* refers to a shared vision for running a school in which everyone can make a contribution, and staff are encouraged to collectively undertake activities and reflection in order to constantly improve their students' performance.

The participative nature of professional learning communities provides a setting for the implementation of integrated strategies and approaches for promoting learning, such as universal design. This method is an effective way to ensure success in literacy and numeracy for all students, including students with special needs.

The concept of *professional* learning communities differs, however, from the concept of *communities of learners*, defined as follows: "The learning community includes school staff, students, parents, and community partners who are called on to work together at school improvement and at creating learning opportunities for students. An essential component to this is a structured school-community projects program whose activities are linked to school goals" (Epstein & Clark Salinas, 2004, p. 12).

The Nature of Professional Learning Communities

Members of a school who embrace the characteristics of a professional learning community will be able to achieve goals that they could not reach on their own (Dufour & Eaker, 1998). A school's learning environment is enhanced by the cooperation of all concerned and by reflective dialogue where respectful exchanges of ideas on teaching, students, and learning facilitate debate about effective strategies (Hord, 1997).

People exchange their points of view and constantly seek to learn. Collectively and collaboratively, they work together to promote positive results in students' learning through consensus, sharing ideas, information, and materials.

A professional learning community is based on the following principles and values (Danielson & McGreat, 2000; Levine & Shapiro, 2004):

- A common impetus for change
- A shared vision and common goals regarding the need for universal design in the school
- The belief that all members of the school team are equal, which can lead to increased collaborative planning among staff to support the needs of special learners
- The commitment of all team members to actions that improve student achievement, with focused support for students with special needs
- An environment that encourages risk taking, where people are not afraid to comment and communicate their ideas for supporting students
- The recognition by staff that professional inquiry is crucial, including disciplined and facilitated access of research-supported teaching strategies
- Shared responsibility among staff members for students with special needs
- Planning for assessment reflected in a school-wide action plan with indicators for achievement of objectives, including systematic and ongoing support structures for students with special needs

Characteristics of professional learning communities

- Shared vision and values that lead to a collective commitment of school staff, which is expressed in day-to-day practices
- Solutions actively sought, openness to new ideas
- Working teams cooperate to achieve common goals
- Encouragement of experimentation as an opportunity to learn
- Questioning of the status quo, leading to an ongoing quest for improvement and professional learning
- Continuous improvement based on evaluation of outcomes rather than on the intentions expressed
- Reflection in order to study the operation and impacts of actions taken

(Dufour & Eaker, 1998; Levine & Shapiro, 2004)

Why Promote Professional Learning Communities?

Like any change or a new strategy, developing a professional learning community to foster the development of literacy and numeracy requires time and effort. The advantages are worth this initial work. They include:

- Active participation of members in decision making
- A collaborative choice of strategies that can be implemented to promote academic development
- Concerted planning to implement those strategies the group chooses
- Continuity in choice of strategies within a school, among classes at the same level, and between levels
- Sharing of information and materials among members of the learning community
- Shared responsibility for implementation of strategies
- Discussions of the needs of students under the supervision of the learning community, so that the response to these needs is a responsibility shared by all
- Information sharing for students' transition from one school year to another (for example, discussion of students' portfolios, so that it takes less time to get to know the students at the start of the school year)
- Easier access to support
- Sharing of duties for successful implementation of strategies: the teacher does not have the whole burden on his or her shoulders
- Innovation and creativity

According to several studies that have examined the effects of implementing a participative management method such as learning communities,[3] the most notable impact is that participants develop a feeling of empowerment – a feeling that their strengths and skills are allied, that they have natural systems for mutual help, and that they engage in proactive behaviour when facing changes (Zimmerman & Rappaport, 1988).

The researchers further noted that teachers felt:

- less isolated when faced with complex tasks;
- more confident in dealing with new, unfamiliar strategies;
- more effective;
- that they belonged to a group;
- that change was possible and they could make a contribution;
- increased self-confidence and self-esteem;
- that their individual efforts would be supported by the group;
- that they could experience leadership development.

> An organization that operates as a learning community relies on a culture of collegiality, which leads the principal and his or her teachers to work with obvious professionalism, and to work together as colleagues in a spirit of family, while showing mutual willingness to listen and confidence, seeking in this way to learn from one another in order to improve their potential, and the potential of the entire team.
>
> (Koffi, Laurin, & Moreau, 2000)

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[3] Among these studies is the *Better Beginnings, Better Futures* study (Peters et al., 2004).

Creating a Culture Favourable to a Professional Learning Community

Eaker, Dufour, & Burnette (2002) suggest that the following conceptual framework can help schools along the complex path of establishing a professional learning community:

- A solid foundation, developed collaboratively, made up of a mission, a vision, shared values, and the goal of student success
- Interdependent teams working together towards common objectives
- A results-oriented attitude, indicating commitment to continuous improvement

Gather-Thurler (2000) has established some conditions that are favourable for initiating change in an organization, such as establishing a professional learning community in a school. They are classified under six dimensions, which are summarized in Table 4. This chart can be used as a tool to reflect on the mechanisms already in place in the school and to identify changes that need to be initiated.

Table 4. Conditions for Organizational Change

Is Your School Ready to Change and Become a Professional Learning Community?

	Unfavourable	Favourable
How work is organized	Inflexible organization: everyone protects and keeps to his or her own timetable, area of specialization, routines, and specified duties.	Flexible, collaborative organization that fosters reorganization to address needs, initiatives, and problems.
Professional relations	Individualism: "egg carton" model with few discussions about professional matters.	Collegiality and cooperation: discussions of professional challenges and shared undertakings.
Culture and collective identity	Teachers see their job as a set of routines to be completed, each on their own, without much reflective thought.	Teachers see their job as one where problems are to be solved, and one that requires reflection.
Ability to plan for the future	Initiatives are developed with a view to taking power, even to circumventing the authorities. Only part of the team supports them.	Initiatives are developed as a result of negotiation, at the end of which the majority of the team supports the objectives, content, and implementation strategy.
Leadership and ways of exercising power	The principal prefers to manage and operate alone, based on a bureaucratic, authoritarian model.	Leadership, including the role and function of the principal, is collaborative; authority is shared.
School as a learning organization	Teachers see the school as merely a workplace, and have little concern about its future. They feel obliged to be accountable to authority for results and methods.	Teachers see themselves as professionals, working on solutions to problems and improving the quality of instruction. They feel obliged to acquire competencies, and to be accountable to their peers.

(Based on Gather-Thurler, 2000, p. 13)

Suggestions for Getting Started

A multidisciplinary team, comprised of members with different duties within the school, in consultation with *all* school personnel and with parents and students, can work together as a team to collectively achieve consensus around priority values and the school's values, vision, and mission.

The team reviews the characteristics of a professional learning community and the school's current capacity, and then develops a school plan. This plan needs to support the school board's plan for literacy and numeracy, and includes a strategy to implement clearly stated actions that will help students with special needs succeed in literacy and numeracy.

Next, staff can meet to develop common objectives and actions that will help them achieve the goals and objectives set out in the school plan. They should plan to meet regularly during the school year to assess these goals and objectives using measurable success indicators, and to monitor and modify their plan. Time for discussion among staff from all divisions ensures a continuum of achievement of the goals. Ongoing monitoring of the school's capacity is important.

Teams should be able to work in an interdependent manner, allowing time for discussion among staff from different grades to ensure a continuum in the achievement of the goals that have been identified and also to ensure harmonious and productive transitions from one grade to another and from one division to another.

A fully developed professional learning community requires the commitment and support of the school board. Resources will need to be made available to ensure all staff have opportunities to work as an effective team.

The Role of the Principal

Success in setting up a professional learning community in a school depends a great deal on the leadership style of the school's principal. Principals of professional learning communities need to facilitate and encourage:

- a school culture in which members care deeply about the success of all students;
- a collaborative culture among the teachers that sustains continuous improvement in the service of all students;
- individualized support for teachers based on their needs;
- support staff, district and community resources, and professional development to assist teachers;
- a "can-do" attitude among staff, a sense of efficacy, and optimism about the students with special needs;
- a culture of disciplined entrepreneurship and collective self-efficacy;
- the coordination of school programs that are focused on learning and sustained over time;
- a focus on learning;
- timely and regular monitoring of each student's learning.

Questions to ask when setting up a learning community

- Where do we want to go?
- Who is working with us?
- What do we want to achieve as soon as possible and what can wait?
- What do we need to invest?
- What skills do we need to develop before starting?
- How will we monitor our progress?
- How and when will we know if we have achieved our objectives?
- What mechanisms for cooperation should be instituted to decide on adjustments to be undertaken?
- Is the project concerned only acceptable to, and accepted by, those who conceived it, or do the people who are supposed to cooperate in its implementation (students, parents, school authorities) also support it?
- Is there support for scheduling ongoing meetings where information is communicated, strategies are exchanged, problems are shared, and common solutions are developed?

(Gather-Thurler, 2000; Koffi et al., 2000)

6

Research to Practice: What Works for Both Literacy and Numeracy

> *"... constructing teaching practices on a firm scientific foundation does not mean denying the craft aspects of teaching."*
>
> *(Stanovich & Stanovich, 2003, p. 3)*

The Importance of Basing Instruction on Evidence-based Instructional Practices

Educational research seeks to determine the nature and type of instructional components that are effective in improving the literacy and numeracy skills of a wide range of learners, including learners with special needs. There is an extensive body of research regarding best practices for literacy instruction (Expert Panel on Early Reading in Ontario, 2003; Expert Panel on Literacy in Grades 4 to 6 in Ontario, 2004; National Reading Panel, 2000), and research on numeracy instruction has made considerable gains in the past years regarding the identification of key instructional components for facilitating numeracy in students with and without special needs (Expert Panel on Early Math in Ontario, 2003; Expert Panel on Mathematics in Grades 4 to 6 in Ontario, 2004; Fuchs & Fuchs, 2001).

This research can provide teachers with a roadmap that highlights effective teaching techniques for all students. It is a roadmap we should pay attention to, because one of its most sobering findings is the evidence demonstrating the *significant lack of progress* that students with special needs in literacy or numeracy exhibit *when not receiving a program based on research-supported instructional components.* It is critical that instructional practices for all students reflect the best of what is available.

A growing body of research indicates that the following classroom-level practices are effective for all learners, but are particularly beneficial for students with special needs in literacy and/or numeracy.

The Tiered Approach to Early Identification and Intervention

As outlined in earlier chapters on assessment and learning profiles, frequent and accurate assessment, evaluation, and progress monitoring by the classroom teacher comprise the engine that drives change in instruction to meet the needs of all students (see Lyon, Fletcher, Fuchs, & Chhabra, in press).

An extremely effective approach to assessment and intervention is the "tiered" approach, which sequentially increases the intensity of instructional interventions (Vaughn & Fuchs, 2003). It promotes and facilitates early identification of students who are at risk, and therefore prevents learning difficulties. In addition, this approach ensures adequate interventions for students exhibiting persistent learning difficulties (Vaughn et al., 2003). For best outcomes, it should begin in Kindergarten, as students who are at risk can be identified early and provided with the appropriate intensity of instruction to prevent later persistent difficulties (Vaughn, Linan-Thompson, & Hickman, 2003). The use of the "tiered" approach in the early years has been shown to dramatically reduce the number of students in the later grades who would meet criteria for learning disabilities (O'Connor, 2000; Vaughn et al.).

The first tier consists of sound classroom instruction, based on successful practice for all students. Assessment in this tier is classroom-based and involves the teacher monitoring the progress of the class and flagging any at-risk students. The classroom and individual learning profiles described in this report would be useful tools for the teacher to use to monitor student progress, plan differentiated instructional strategies, and identify at-risk learners.

The second tier requires teachers to identify students who have failed to progress satisfactorily in tier 1 instruction. Tier 2 involves more intensive instruction (individually or in small groups) in addition to the tier 1 programming. This level of instruction may include other members of the school staff (e.g., special education teacher, teacher's assistants).

The third tier is for students who do not respond to instructional efforts in tiers 1 and 2. These students may need to be referred for more extensive psycho-educational assessment. This type of assessment information, coupled with classroom observations and teacher assessment of the students' previous responses to intervention strategies, can then be used to guide more specialized instruction.

The success of this approach is dependent upon the teachers receiving adequate professional development in teacher-based assessment practices, progress monitoring, and intervention strategies for students with special needs (Lyon et al., in press). Such professional development is particularly important for teachers working in the very early grades who are on the front lines in terms of identifying children who are at risk for learning difficulties.

Essential Instructional Components for Both Literacy and Numeracy

Knowing whether or not a student is exhibiting problems in literacy and/or numeracy (Lyon et al., in press) may in many cases be more useful than knowing that the student has a specific diagnosis (e.g., learning disability). Once a teacher identifies a child's current level of functioning in a given component of literacy and/or numeracy, the teacher can plan instruction that promotes achievement in this area.

The importance of determining a student's current level of functioning is evident in L.S. Vygotsky's concept of the "zone of proximal development". According to Vygotsky (1980), a student's current level of achievement is the zone of actual development. Teachers should aim to help students *move towards the next level of development – the zone of proximal development.* Instructional supports, which can include collaborative and supportive interactions between a student and a more knowledgeable other, help students bridge the gap between what they know and what they do not know.

In addition to providing instruction in those aspects of the curriculum that are critical to the development of literacy or numeracy skills (e.g., phonemic awareness), instructional researchers have also identified several essential instructional components that are particularly important when instructing students with special needs.

Instruction must be of sufficient *duration* and *intensity* to produce adequate learning and application to new situations. Students with special needs may require interventions of longer duration and intensity than other students in order to achieve mastery of both foundational and higher-level skills (e.g., Blachman et al., 2004). Research has shown that students with special needs may need more learning opportunities distributed over a longer time to make sufficient gains. In addition, students with special needs may need instruction that is of greater intensity (e.g., more small-group or peer-assisted learning activities). Teachers can make decisions regarding the intensity and duration of instructional components by carefully monitoring progress (e.g., using curriculum-based measurement tools) and thereby gauging a student's response to instruction.

Students with special needs benefit from cumulative review of important concepts and skills. Cumulative review of previously mastered content promotes retention. Early in the learning of a new skill, children are error-prone, not very fluent, and inconsistent in their application of skills to new situations. Children with special needs, in particular, can be more error-prone and less fluent or consistent for longer periods of time than their classmates. Hence, these children may need more opportunities to practise their skills and to review prior learning. Cumulative review should also be judicious review (reviewing key skills and concepts that are not consolidated) and should incorporate a wide range of activities. For example, students who struggle with learning letter–sound relationships may need to continually review previously learned sounds and sight words (Blachman et al., 2004). These reviews can be quick oral reviews (e.g., "Tell me the following sounds for these letters.") or perhaps a short activity or structured game targeting the skill.

Students with special needs require guided practice to help them bridge the gap between what they know and don't know, and they need to receive explicit instruction in how to apply learned information in new situations. Students with special needs are particularly in need of guided practice and specific instruction that helps them transfer their skills to new problem-solving contexts and to situations that present new content, but require previously taught skills (Baker, Gersten, & Scanlon, 2002; Fuchs et al., 2003a, 2003b).

Teachers need to monitor their instructional language (both oral and written). They should ensure that they use the appropriate level of explicitness when communicating with students, provide concrete examples, fully elaborate on concepts, provide feedback that guides student thinking, and provide explicit error correction or positive feedback (Englert, Raphael, Anderson, Anthony, & Stevens, 1991; Foorman & Torgesen, 2001).

Instruction needs to integrate both foundation skills (e.g., word decoding) and higher-order processes (e.g., monitoring for understanding) concurrently for students to be able to apply their knowledge and skills. Whether it is reading or mathematics, students need systematic instruction to achieve fluency in foundational skills such as computational procedures and decoding if they are to achieve proficiency in higher-order skills. At the same time, however, students need to receive instruction that also targets higher-order skills such as problem-solving and comprehension strategies. For example, a student may lack word-recognition skills, and hence these weaknesses need to be a focus of instruction. In addition, however, the student should be taught comprehension strategies to help him or her understand text (e.g., the teacher could model the strategies when reading aloud from a more advanced text).

Students benefit from clear, organized teaching that makes explicit connections across previous and current content areas. Students need clear instruction on basic skills and procedures as well as on the use of higher-order strategies and metacognitive principles that promote and consolidate learning (Swanson, 1999).

Specific Instructional Strategies Supported by Research

There are a variety of specific teaching strategies that can facilitate learning across multiple academic domains, including written expression, reading comprehension, decoding, and math problem solving. The instructional strategies described below encompass teaching techniques such as scaffolding, modelling, supportive instructional language, and guided practice as well as concrete tools for students to use, such as cue cards (Rosenshine & Meister, 1992). Instructional strategies also include providing students with a "plan of action" regarding a particular task or cognitive process, such as monitoring for understanding (Baker et al., 2002). Students benefit greatly when teachers use instructional strategies in an integrated fashion. Instruction in higher-order cognitive thinking processes, for instance, could incorporate modelling, guided practice, and concrete prompts.

Scaffolding

Scaffolding is a term used to refer to a number of specific instructional strategies that a teacher can use, all of which have two interrelated goals: to move the student from one place to another in terms of learning, and to gradually transfer the responsibility for learning from the teacher to the student, thereby fostering a more independent learner.

Scaffolding proceeds from the assumption that the learning task is located in the student's zone of proximal development. It therefore entails temporary and adjustable supports and guidance. These are gradually phased out as the student demonstrates competence with the concepts or procedures being taught. Hence, scaffolds can include such diverse activities as teachers activating background knowledge, providing prompts or think sheets, or facilitating guided practice.

Teachers can use the following eight essential elements of scaffolded instruction interactively to support student learning and provide students with the cognitive and emotional support they need to successfully learn new skills or strategies:[4]

1. **Engage in preplanning.** Teachers develop classroom and individual learning profiles, then select appropriate tasks by considering the goals of the curriculum as well as students' needs.
2. **Establish a shared goal.** Students and teachers work together to identify instructional goals. For example, the student and the teacher may identify a goal to work towards for a given type of skill, such as the ability to read an independent-level text aloud without errors.
3. **Identify student needs and monitor progress.** Teachers must be sensitive to students' needs and current level of knowledge, and frequently monitor progress and understanding.
4. **Provide tailored assistance.** Teachers use a range of instructional supports or scaffolds to provide needed support, and adjust these supports as needed.
5. **Maintain pursuit of the goal.** Teachers help students remain focused on the goal through questioning and dialogue and by providing emotional support (i.e., praise and encouragement).
6. **Give feedback.** Teachers provide specific feedback that highlights student progress and specific behaviours that contributed to success.
7. **Control for frustration and risk.** Teachers create a learning environment that is not beyond what a student can accomplish and one in which students feel comfortable taking risks.
8. **Assist internalization, independence, and generalization.** Teachers provides students with sufficient opportunities to internalize a task or process, and gradually phase out support. Teachers can help students generalize their learning by identifying other contexts where they can apply the process and actively encouraging the students to practise the task or process in these contexts.

Modelling

Modelling can take on a number of forms.

Teachers can "*think aloud*". They can overtly verbalize the thought processes used to complete a particular activity. Research has shown that when teachers use think-aloud techniques to demonstrate the cognitive processes related to the writing process, students improve in their ability to write expository text (Englert et al., 1991). Similarly, teachers can use think-aloud techniques to model how a reader processes text (Gunning, 1996).

Teachers can *model learning strategies*. For example, by modelling good reading strategies the teacher makes explicit those skills that cannot be readily perceived by the students. Students can also be invited to think out loud and model their strategies for decoding words, making predictions, summarizing, and evaluating text.

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[4] Hogan and Pressley's (1997) eight essential elements of scaffolded instruction, outlined in Larkin (2001).

Teachers can *demonstrate the task*. The teacher may, for example, demonstrate all the steps in completing a graphic organizer or show the steps that students need to take to solve a specific type of math problem (e.g., Fuchs et al., 2003b).

Instructional language

Language of instruction refers to the oral language used in the classroom to instruct and communicate expectations. It also includes the print-based materials used in the class to communicate content and instructions. Teachers can modify and/or expand upon the language of instruction in a variety of ways in order to more effectively communicate important information about procedures and concepts to be learned. As well, language can be used to support and encourage independent learning in students with special educational needs. Sometimes, these students will need to hear ideas reformulated in different ways and will benefit from multiple opportunities to listen to the teacher. Teachers can *provide important tips, cues, and explicit feedback* in the form of interactive dialogue, thus acting as the students' coach (Englert et al., 1991). Teachers can *vary the complexity of their language of instruction (oral and written)*, via the number/amount, sequence, and/or complexity of instructions or information. They can, for instance, explicitly state themes rather than have students infer them, vary pacing, and elaborate and review key ideas (Lapadat, 2002). For example, teachers may need to:

- simplify and shorten instructions (often visual reminders/cues are useful);
- provide concrete examples of more abstract concepts;
- use analogies;
- present new information with an emphasis on main ideas and provide clear conceptual links between key ideas and supporting details.

Guided practice

The teacher can provide students with support and guidance as they initially learn new information or tasks, and then gradually phase out this support as the students become more proficient. Guided practice is critically important to many effective instructional programs, including those targeting mathematical problem solving (Fuchs et al., 2003b), written expression (e.g., Baker, Gersten, & Graham, 2003), and word-recognition skills (Lovett, Lacerenza, & Borden, 2000).

Guided practice is an important way to prevent students from forming misconceptions (Rosenshine, 1997). Some students may come to the task lacking in prior knowledge and

How to conduct guided practice

1. *The students and the teacher work together to perform the task.* Students can contribute to the task (for instance, solve a particular step of a math problem), but they are not required to perform the entire task independently.
2. *Students work in small groups or with a partner.* Once some proficiency is gained, the students begin to practise the task more independently but still receive supportive feedback regarding their progress as they complete the task.
3. *Students engage in independent practice* to promote mastery and automaticity.

(Based on Expert Panel on Early Reading, 2003; Expert Panel on Literacy in Grades 4 to 6, 2004) may be overwhelmed by the complexity or amount of new information. Other students may have limited working memory capacity or poor language skills and thus will also struggle to process the information that is presented. Guided practice helps students understand and clarify task expectations and facilitates their ability to link new knowledge with existing concepts.

Strategy instruction

Independent and successful learners tend to use a broad array of strategies to solve problems and mediate their own learning. Some students, however, may lack knowledge of effective learning strategies or may require more structure and guidance to exhibit self-regulatory and strategic behaviour. Teachers can provide these students with an outline of the critical steps in a task or process and how they should sequence or integrate these steps, via strategies or "action plans" that highlight efficient and effective ways to perform complex tasks such as composing expository text.

Providing students with instruction in "how to learn" enables students to become more efficient learners. Moreover, the action plan provides an organizational structure that helps the student focus on carrying out the task rather than trying to think about what to do next while also trying to implement the process (Baker et al., 2003). With repeated practice and instruction that utilizes other important instructional supports (e.g., teacher modelling, concrete representations), a student will begin to internalize the action plan and as a result become a more independent and strategic learner.

Components of explicit strategy instruction

- State process and content objectives.
- Provide information about when and where to use the strategy.
- Provide students with a rationale for using the strategy.
- Provide students with a personal learning story related to strategy use.
- Model using the strategy – think-aloud.
- Provide students with guided instruction – scaffold.
- Provide students with evidence of strategy effectiveness.
- Cue students for transfer and generalization.

(Woloshyn et al., 2001)

Research suggests that instruction in the use of strategies is most effective when it is explicit, especially when working with students with special learning needs (e.g., Kamil et al., 2000; National Reading Panel, 2000). Students benefit from instruction that provides them with knowledge of the types of tools and techniques that can be used to learn new information, integrate information, or communicate information (Baker et al., 2002).

Significantly, research has also shown that students need to have knowledge of the specific types of thinking or strategic approaches used within a given academic domain (Baker et al., 2002). For example, it is important for students to learn the critical strategies relevant to comprehending texts (e.g., clarifying or summarization) and those strategies relevant to creating text (e.g., how to plan, organize, and revise). Teachers can also facilitate student achievement by teaching students why a particular strategy is important, when and where to use it, and how to evaluate its use (Baker et al.; Billingsly & Wildman, 1990).

It is also important to recognize that explicit strategy instruction in reading can unfold in a variety of reading contexts (Au, Carroll, & Scheu, 2001; Stahl & Hayes, 1997). For instance, guided and shared reading provide educators with opportunities to model literacy strategies

Table 5. How Teaching Techniques That Facilitate Learning Might "Sound" in a Classroom

<table>
<tr><th>Teaching technique</th><th>What you might hear in the classroom</th></tr>
<tr><td>Modelling</td><td>Think-aloud comments that model text-processing strategies:
• The pictures on the book cover make me think that this book is about …
• The title makes me think about …
• Reading this book might help me …
• I think that … will happen next.
• I don't understand this word/sentence so I will …
• This book is organized like …
• I need to go back and reread this part of the book because …
• The important idea of this part is …
• In the beginning …, then …, and finally …</td></tr>
<tr><td>Instructional Language</td><td>Tips, cues, and specific feedback:
<i>"What sound comes next?"</i>
<i>"The next step in the strategy is to examine the overall appearance of your work."</i>
<i>"You used your KWL [Know-Wonder-Learn] chart to help you understand what you know about this story."</i></td></tr>
<tr><td>Guided Practice</td><td>Teacher: "<i>Let's sound out this word together.</i>"
She points to the word "mat." The teacher and the students slowly sound the word out together while the teacher points to each letter: "<i>mmmaaat</i>".
Teacher: "<i>What is the word?</i>"
Students' response: "<i>Mat.</i>"</td></tr>
<tr><td>Strategy Instruction</td><td>Teaching how to use a KWL [Know-Wonder-Learn] graphic organizer for reading
Book Title: <i>Lost in the Barrens</i>
<table>
<tr><th>What I Know</th><th>What I Wonder</th><th>What I Learned</th></tr>
<tr><td>I know that the barrens are cold and isolated.
It looks like it is about someone who gets lost, so I think it is probably an adventure.</td><td>Where are the barrens?
How cold is it there?
Is it difficult to survive in the barrens?
What would you need to survive?</td><td>(to be completed after the text is read)</td></tr>
</table>
</td></tr>
</table>

and scaffold students' use of literacy strategies. Independent reading allows students with opportunities to practise these skills in a self-directed manner, with read-alouds providing educators with opportunities to monitor students' independent use of literacy strategies. During each reading activity, educators need to be responsive to the students' learning needs and performances and be flexible with respect to instructional venue.

For instance, if during a read-aloud, a teacher observes that a student is using a strategic approach inappropriately (e.g., using irrelevant knowledge to make predictions), he or she may want to revert to a guided reading session where appropriate strategy use can be modelled (e.g., activation of relevant background information). In other words, educators need to be flexible in their decision making based on the knowledge of instructional methodologies, students' learning profiles, and students' response to instruction.

Concrete Instructional Tools That Support Student Learning

Children with special needs may better encode and retrieve new information if it is presented in a structured way (e.g., graphic organizer, advance organizer) (DiCecco & Gleason, 2002). In addition, students with special learning needs may have difficulty retrieving information from memory and thus may benefit from cueing strategies to help them recall specific procedures, routines, or academic information they have successfully encoded but cannot retrieve, such as asking them to select the right answer from a list, providing checklists of key activities to complete, or providing procedural facilitators (see Baker et al., 2002, and the findings of McNamara & Wong, 2003). In addition, concrete instructional supports also tend to reduce the processing load on the learner.

Graphic aids can include "*think sheets*" (e.g., Englert et al., 1991), *cue cards* and *prompts* (e.g., Vaughn & Klinger, 1999), or *posters*. For example, Fuchs et al. (2003b) incorporated the use of posters to remind students of the steps needed to solve different problem types in their instructional treatment programs targeting mathematical problem-solving skills. In addition, Fuchs et al. used posters to help students identify the ways in which problems can change.

Teachers can also provide students with a *concrete analogy* or *picture* of an abstract or difficult concept. Lovett, Lacerenza, and Borden (2000) describe the following strategy-based decoding program in which visual aids are used to support the use of specific word-decoding strategies. To support the strategy "Vowel Alert", the teacher provided students with a visual support in the form of a Vowel Alert stoplight. This cue reminds students that they need to stop (red light), be cautious (yellow light) and try both sounds, such as a long "a" sound and short "a" sound, and then go (green light) once they get the sound that gives them the correct word.

A *graphic organizer* is a visual aid that can be helpful in demonstrating how concepts are connected or related to students who may not have well-organized prior knowledge or have difficulty in making inferences or understanding the relationships among main ideas and details. They provide students with a visual depiction of the relationship between superordinate and subordinate concepts (DiCecco & Gleason, 2002).

Research on teaching higher-order cognitive strategies has also highlighted the value of providing students with *acronyms* and *visual prompts* of the key steps in a complex activity. The acronyms POW (Pick an Idea, Organize Notes, and Write and Say More), for instance, has been shown to help students in writing an expository text (Harris, Graham, & Mason, 2002). These cues can be on a poster or on a think sheet that the students can refer to when developing their text. In addition to providing the students with a concrete reminder of the critical processes or steps, they also provide students and teachers with a common language to discuss the process (Baker et al., 2002).

Involving Students in the Learning Process

For both reading and mathematics, instructional strategies that increase the amount of time that the student is engaged in the learning process are effective for all students, particularly those with special needs. The following instructional strategies have been shown to be particularly useful in improving the learning of students with special needs.

Peer-assisted learning strategies (PALS)

Peer-assisted learning strategies (PALS) provide students with effective opportunities to be engaged in the learning process (Fuchs, Fuchs, & Karn, 2001; Mathes, Howard, Allen, & Fuchs, 1998). PALS has been effectively used to boost students' reading and mathematics achievement (Fuchs, Fuchs, Mathes, & Simmons, 1997; Fuchs, Fuchs, Yazdian, & Powell, 2002; Mathes et al.). PALS permits the teacher to "pair students together to work intensively on structured activities that are appropriate to individual needs" (Fuchs et al., 2002, p. 569).

PALS is an effective technique for taking advantage of mixed-ability grouping, and can be used with students from Kindergarten to high school. It enhances both new skill learning and transfer of those skills to new problem-solving situations, and increases feelings of self-efficacy for all learners (Lyon et al., in press). Research suggests that putting students with similar achievement levels into a group separate from the rest of the class is detrimental to students with special needs and does little for high-achieving students, if the same curriculum is being delivered to all students (Whitehurst, 2003).

Key components of PALS are:

- *structured interactions* between partners;
- *frequent interaction and feedback* between partners; and
- *role reciprocity* (each student has the opportunity to act as the tutor).

In other words, PALS does not simply involve putting students together and asking them to help each other. It is the structured peer relationships and the playing of different roles by each student in PALS that lead to positive outcomes.

Prior to beginning the PALS lessons, the teacher explicitly instructs students in the components of PALS (e.g., rules, coach's job, player's job, error correction procedures) using brief scripted lessons (see Mathes et al., 1998, for an example involving instruction in reading). Significantly, this research has mainly been conducted in heterogeneous classrooms with students of a range of abilities, and there is evidence that PALS results in significant growth for low-achieving, average, and high-achieving students (Fuchs et al., 1997, 2002). Thus, PALS provides teachers with strategies for differentiating instruction to address the range of academic needs in their classrooms.

For example, Fuchs et al. (2002) used PALS to enhance Grade 1 students' mathematical development. In this study, teachers used PALS three times a week for 30 minutes each time for 16 weeks. High-achieving students were paired with low-achieving students for three weeks and then pairings were switched every three weeks to provide children with exposure to a range of partners. At the beginning of each session the teacher reviewed/taught the key math concepts that were to be the focus of the PALS session for that day. For each session, the stronger student acted as the coach first. Halfway through the session, the students switched roles and the player became the coach and vice versa. The results showed that those students who received the enhanced PALS program did significantly better on the targeted math topics than students receiving the same math curriculum without the PALS components.

Self-regulation strategies

Self-regulated learning is a goal for all students. One of its key aspects is that the student becomes able to self-assess his or her learning (Paris & Paris, 2001). Hence, students should be encouraged to take an active role in the learning process and evaluate their levels of understanding, personal interests, and the types of strategies used to complete a task. Students can monitor their progress and note the association between actions (e.g., effort, use of a particular strategy) and outcome (increased ability, reaching goals). In turn, this can promote students' self-efficacy (Paris & Paris).

The research indicates that self-regulated learning instruction can augment strategic instruction in written composition for children with special needs (Sawyer, Graham, & Harris, 1992) and can promote students' ability to apply knowledge, skills, and strategies to novel mathematical problems (Fuchs et al., 2003b).

Teachers can explicitly teach self-regulation through overt instruction and directed reflection, and/or promote it indirectly through modelling and activities that involve aspects of self-regulation.

Self-regulation instructional components can include *student goal setting* (daily, weekly) and *teaching students how to monitor progress* (e.g., providing students with tools to graph daily progress). Research suggests that students with special needs learn at a faster rate when they set their learning goals and when they can see the progress they are making towards those goals through graphing of progress.

Providing Comprehensive Instruction That Focuses Specifically on Weak Academic Skills

All students require evidence-based instructional programs and teaching strategies that directly target their specific weak academic skills – including their academic needs in literacy and numeracy.

Instruction should be comprehensive (Lyon et al., in press), because students with special needs do not generalize learning to new situations or domains easily. For example, for many students who are poor readers, intensive and systematic instruction in word-recognition skills can improve decoding skills, though subsequent gains in fluency are not as evident (e.g., Torgesen et al., 2001). Similarly, although gains in word recognition can improve comprehension to some degree, students may still need specific instruction in reading comprehension strategies to make the greatest gains (Lyon et al.). Hence, gains are often specific to what is taught.

There is no evidence that providing students with special needs with instructional programs that do not specifically focus on their specific academic needs is effective. For example, targeting motor skills, self-esteem, learning styles, and brain-based learning will not improve academic skills in and of themselves.

A critical finding from the research is the fact that student achievement is highly related to instructional practices. Simply put, when students receive instruction that reflects "successful practices" they demonstrate significantly greater growth in targeted domains than students who are not receiving "best practice" instruction (Blachman et al., 2004; Foorman, Francis, Fletcher, Schatschneider, & Mehta, 1998; Graves, Gersten, & Haager, 2004). These findings underscore the need for teachers to use research-based knowledge to guide their instructional decision making. Such a foundation will facilitate their ability to provide optimal learning opportunities for all students in their classes (O'Connor, 2004; Stanovich & Stanovich, 2003).

7

Effective Instructional Approaches and Teaching Strategies for Numeracy

> *"An effective mathematics program should include a variety of problem-solving experiences and a balanced array of pedagogical approaches. An essential aspect of an effective mathematics program is balance (Kilpatrick, Swafford, & Findell, 2001)."*
>
> *(Expert Panel on Mathematics in Grades 4 to 6 in Ontario, 2004, p. 7).*

Difficulties in mathematics are as common as difficulties in reading. Math difficulties co-occur in about half of all children who have learning difficulties in other domains such as reading, writing, and oral language (Fleishner, 1994; Shalev, Auerbach, Manor, & Gross-Tsur, 2000). Despite these facts, research on why some children have difficulty acquiring math skills is less well developed than similar research on the origins of reading difficulties. As well, there is less research on the efficacy of instructional programs in mathematics and effective math interventions; reading programs outnumber mathematics programs 6 to 1 (Whitehurst, 2003).

Guiding Principles

To effectively teach mathematics to a classroom of learners that includes students with special needs, teachers need to understand the following:

- The teacher plays a critical role in student success in mathematics.
- There are general principles of children's learning of mathematics.
- The mathematics curriculum is developmental.
- The "big ideas" are key concepts of mathematics.
- There is an important connection between procedural knowledge and conceptual understanding of mathematics.
- The use of concrete materials is fundamental to learning and provides a means of representing concepts and student understanding.
- The teaching and learning process involves ongoing assessment.

The role of the teacher[5]

> *"Knowledge of mathematics includes (a) understanding the meaning, principles, and processes of a wide range of mathematics appropriate to the needs of the students; (b) recognizing unusual performance on the part of a student and how to adapt activities to determine the basis for this performance; and (c) knowing the developmental characteristics of the student in such detail that individualized curriculum choices can be made as to* ***when*** *it is an appropriate time to present certain mathematics to a student, the* ***sequence*** *in which it should be presented, the* ***intensity*** *or length of time one will stay with a topic to assure mastery, the* ***mixture*** *of mathematics that should be presented, and* ***how*** *to determine that a student has attained proficiency and mastery of the principles."*
>
> *(Parmar & Cawley, 1998, p. 225)*

More than in any other subject area, students' progress in mathematics is closely linked to the teacher's knowledge about children's mathematical development and teacher preparation in the teaching of mathematics (Ginsburg, Klein, & Starkey, 1998). A teacher with a sound understanding of the mathematics content, together with a knowledge of how students learn best, is equipped to provide experiences that meet the needs of all learners.

The teacher is the child's most important role model for mathematics learning, and so it is crucial that he or she adopt a knowledgeable, enthusiastic, and positive attitude towards mathematics and its applications (Mercer & Mercer, 1998). Several studies show a relationship between a student's attitude towards mathematics and achievement in mathematics (Dossey, Mullis, Lindquist, & Chambers, 1998).

How children learn mathematics

> *"Many elements must be acknowledged about the early learner of mathematics. These include recognition of the developmental aspects of learning, the importance of building on prior mathematical understanding, and the essential fact that children learn mathematices primarily through '... doing, talking, reflecting, discussing, observing, investigating, listening, and reasoning' (Copley, 2000, p. 29)."*
>
> *(Expert Panel on Early Math in Ontario, 2003, p. 7)*

Children need time and a variety of contexts to learn and consolidate mathematical concepts and procedures. Children can, for instance, practise addition facts in a variety of ways throughout the instructional year by solving problems in context, playing games, using manipulatives, using visual aides (ten frames, dot cards, flash cards), and completing worksheets. Children with special needs often require additional time, many concrete experiences in different contexts, and extra guidance from the teacher to understand and demonstrate their mathematical knowledge.

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[5] Expert Panel on Early Math in Ontario (2003), pp. 7–11, provides information about children's early mathematical development, the role of the teacher in mathematics education, and how teachers can use a child's pre-existing mathematical knowledge to facilitate new learning in mathematics.

The nature of the mathematics curriculum

More than in any other subject area, later learning in mathematics is closely tied to prior learning. As students move through the primary and junior grades, the mathematics content becomes increasingly sophisticated and abstract. Arithmetic concepts and skills learned in primary grades, for instance, lead to algebra skills in later years; data management concepts broaden to include more data analysis and probability (Expert Panel on Mathematics in Grades 4 to 6, 2004, p. 1). Students require prerequisite skills to learn the new, more sophisticated and abstract concepts and skills, and are expected to demonstrate a higher level of proficiency with each passing year. Teachers need to work closely with students to help them avoid falling behind. Before students can understand and work with fractions, for instance, they need many experiences with whole numbers. If students fail to develop a conceptual understanding at an early stage, they will continue to have difficulties learning new concepts until foundational concepts have been mastered.

The focus on "big ideas" in mathematics

> *"Teaching that uses big ideas or key concepts allows students to make connections instead of seeing mathematics as disconnected ideas."*
>
> *(Expert Panel on Early Math, 2003, p. 16)*

Teaching "big ideas" allows the teacher to focus his or her planning and instruction on important mathematical concepts and provides teachers and students alike with a global view of the concepts in the strand. For example, when studying geometry, instruction could focus on the big idea of the relationship between 2D shapes and 3D figures (e.g., a cube has six square faces). When studying number sense and numeration, one big idea on which to focus instruction would be different counting strategies (e.g., counting all, counting on, skip counting). *A Guide to Effective Instruction in Mathematics, Kindergarten to Grade 3: Number Sense and Numeration* (Ontario Ministry of Education, 2003a) provides a more complete description of big ideas.

Big ideas also act as a lens for:

- making instructional decisions (e.g., deciding on an emphasis for a lesson or a set of lessons);
- identifying prior learning;
- looking at students' thinking and understanding in relation to the mathematical concepts addressed in the curriculum (e.g., making note of the strategy a student uses to count a set);
- collecting observations and making anecdotal records;
- providing feedback to students;
- determining next steps;
- communicating concepts and providing feedback on student achievement to parents (e.g., in report card comments).[6]

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[6] *A Guide to Effective Instruction in Mathematics, Kindergarten to Grade 3* (Ontario Ministry of Education, 2004a), p. 2.13.

The link between procedural knowledge and conceptual understanding

> *"Conceptual understanding helps students with long-term understandings; procedural knowledge helps students to connect conceptual understanding with symbolic language."*
>
> *(Ontario Ministry of Education, 2004a, p. 2.4)*

Mathematics instruction should focus on the rules and symbols of mathematics (procedural knowledge) and the understanding of concepts and the ability to see relationships (conceptual understanding). An example of procedural knowledge is knowing how to add and subtract; the related conceptual understanding is the recognition of all that is connected to the concept of addition – that it could mean combining two sets, is the reverse operation of subtraction, and is commutative. The link between procedural knowledge and conceptual understanding is more fully explained in *A Guide to Effective Instruction in Mathematics, Kindergarten to Grade 3* (Ontario Ministry of Education, 2004a, pp. 2.4–2.5).

Children with special needs show the most growth in mathematical understanding when instruction concurrently addresses both procedural knowledge and conceptual understanding. In general, whole-class instruction in mathematics has been shown to be effective when both procedural skills and conceptual knowledge are explicitly targeted for instruction; this type of instruction improves outcomes for children across ability levels and grades (e.g., Fuchs, et al., 2002). Moreover, evidence suggests that learning foundational math skills leads to greater conceptual math knowledge and that learning more conceptual math knowledge affects learning of foundational skills (Rittle-Johnson, Siegler, & Alibali, 1998). Waiting for mastery of foundational skills such as arithmetic before teaching problem-solving skills places children with math difficulties at considerable disadvantage in terms of their mathematical skill development (Lyon et al., in press).

The use of concrete materials (manipulatives)[7]

> *"Concrete materials provide students with tactile experiences to help them model, describe, and explore mathematics."*
>
> *(Expert Panel on Early Math, 2003, p. 19)*

The use of concrete materials, and pictures and diagrams, can be particularly helpful in teaching word problem solving to children with special needs in mathematics (Jitendra & Hoff, 1996). Concrete materials provide a context for learning mathematical concepts. As students manipulate, talk, and think, they are able to make connections, see relationships, and test, revise, and confirm their reasoning. Teachers can assess student understanding by observing and questioning students as they use concrete materials. When selecting and using concrete materials in mathematics instruction the teacher needs to consider:

- the appropriateness of the material in relation to the mathematical concept or big idea;

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[7] A comprehensive view on the use of concrete materials in mathematics learning and instruction can be found in Expert Panel on Early Math (2003), pp. 19–28.

- the students' prior experience with concrete materials; and
- the students' learning profile.

The importance of ongoing assessment for teaching and learning[8]

> *"Effective assessment is an ongoing, integral part of the teaching-learning process and includes regular opportunities for children to demonstrate their learning (Connelly, McPhail, Onslow, & Sauer, 1999; Thouin, 1993)."*
>
> (Expert Panel on Early Math, 2003, p. 38)

Research indicates that making assessment an integral part of classroom practice is associated with improved student learning. Black and Wiliam (1998) reviewed about 250 research studies and concluded that the learning of students, including low achievers, is generally enhanced in classrooms where teachers include attention to formative assessment in making judgements about teaching and learning (National Council of Teachers of Mathematics, 2000, p. 1).

Assessment should be planned to focus on important conceptual and procedural understandings, and should be linked with instruction. In other words, teachers should consider appropriate assessment strategies together with appropriate instructional strategies when planning for all students. A variety of assessment strategies will allow teachers to gain insight into what all students know and can do. To assess students at the end of a particular unit of study, a paper-and-pencil test may be an appropriate assessment method for some students, while a performance task will allow other students to better demonstrate their understanding and areas of need.

An Effective Mathematics Learning Environment

The elements presented below, when integrated, create an effective mathematics program that addresses all learners, including those with special needs.

Focusing on the big ideas of mathematics. "The understanding of concepts related to the big ideas in mathematics is critical to students' present and future success in mathematics" (Ontario Ministry of Education, 2004a, p. 8.17). Teachers need to ensure that all students can see the connections between broad concepts in mathematics.

Valuing prior knowledge. Awareness of a student's level of mathematical knowledge allows the teacher to connect what the student knows with what the student needs to learn.

Encouraging connections with everyday life. Students who encounter difficulties in mathematics often have difficulty connecting mathematics with everyday situations. Teachers can help these students make these connections on a continual basis throughout the learning process. Teachers can establish the relevance of mathematics to day-to-day life by reminding students that mathematics is the key to success (Mercer & Mercer, 1993).

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[8] For further information, consult the section on assessment and evaluation in Expert Panel on Early Math (2003), pp. 38–44.

Making resources available. Larger manipulatives, such as geometric shapes, adapted game pieces, oversized tangrams, adapted computers, and oversized calculators, can help students challenged by fine and gross motor skills.

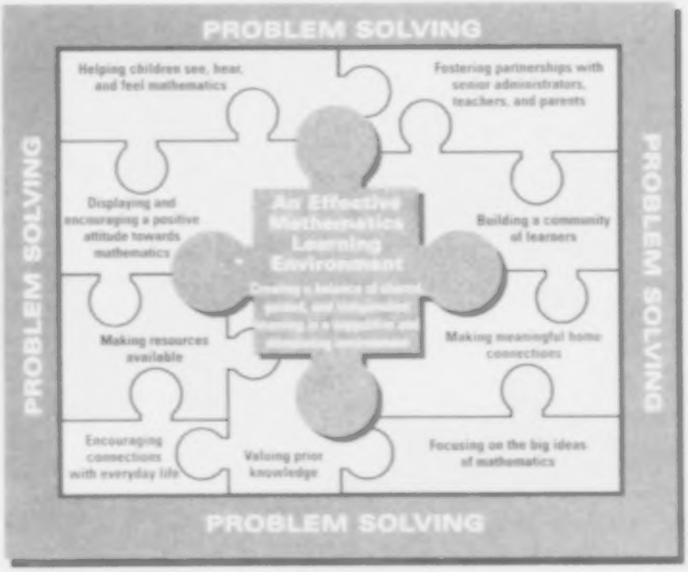
Displaying and encouraging a positive attitude towards mathematics. A positive attitude and a belief in all students' potential affect their level of enthusiasm about mathematics. Teachers can suggest activities in which students with special education needs can be successful. In addition, they can become role models by adopting an enthusiastic and positive attitude towards mathematics and its applications. Here are some specific suggestions (Mercer & Mercer, 1993):

- Encourage students in their efforts, progress, and success.
- Involve students in setting stimulating goals that encourage participation and effort.
- Failure should be infrequent. Provide situations with high success rates.
- Use progress charts that reward students with a visual reminder of their progress.

Helping children see, hear, and feel mathematics. Make connections between the students' work and their successes. Remind students that they have done well at a task because they worked hard, persisted, reread, rethought, visualized, modelled, and so on (Mercer & Mercer, 1993). Provide students with access to activities that help them appreciate mathematics. Give authentic tasks to students with special education needs.

Fostering partnerships with senior administrators, teachers, and parents. Students with special needs often learn mathematics through regular class activities, the interventions of resource teachers and various specialists, and practice with parents. Cooperation among all these partners allows the teacher to better meet student needs.

Figure 6. Elements of an Effective Mathematics Learning Environment


PROBLEM SOLVING
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PROBLEM SOLVING
Helping children see, hear, and feel mathematics
Fostering partnerships with senior administrators, teachers, and parents
Displaying and encouraging a positive attitude towards mathematics
An Effective Mathematics Learning Environment
Building a community of learners
Making resources available
Making meaningful home connections
Encouraging connections with everyday life
Valuing prior knowledge
Focusing on the big ideas of mathematics

(Adapted from Expert Panel on Early Math, 2003, p. 12)

Building a community of learners. Like all students, students with special needs benefit from having experiences that help them feel they are active members of a learning community. Interactions among students are important learning opportunities for everyone. Everyone needs to play a role in the various math-oriented class activities.

Making meaningful home connections. Parents play an important role in the success of students with special needs. With their support, math strategies developed in the school environment can be reinforced outside of school hours.

Creating a balance of shared, guided, and independent learning in a supportive and stimulating environment. It is important to avoid reducing instruction in mathematics to rules and procedures. Teaching students mathematics can be stimulating and varied.

In a mixed-ability regular classroom, the teacher needs to create a comfortable, stimulating environment conducive to learning – a balanced set of shared, guided, and independent learning experiences. To achieve this, the teacher should consider:

- teaching students how to become autonomous learners who:
  - know that they can ask a question;
  - know to whom to address the question;
  - know what concrete materials to use (including calculators and technology);
  - know what resources are available (e.g., strategy wall, bulletin board display, math dictionary);
- individual student and classroom profiles to ensure that the independent activities are developmentally appropriate. Additionally, the programming should be consistent with individual learning plans;
- the types of support that can be provided to assist students when they need it, such as checklists that outline the steps in the problem-solving process, which will help students solve the problem independently;
- employing assessment strategies that allow students to independently demonstrate what they know and can do (e.g., oral responses, reduction in the number of tasks used to assess a concept or skill, use of assistive devices).

The Importance of Teaching Through Problem Solving

> *"Not all successful students will use the same strategy to solve the same problem, and often more than one strategy can be used."*
>
> *([illegible] & Lesley, 2004, p. 223)*
>
> *"By providing knowledge of and practice in applying learning strategies, the teacher invariably indirectly enhances the self-concept and coping abilities of the students, which, in turn, provides the basis for problem solving. Such confidence is essential for students to cope with minor frustrations, to play with ideas, to take educated guesses, to delete, add or modify parts of problems and to select a plan of action and carry it out. Various in-class support groups (e.g., peer tutors, sharing dyads, cooperative learning) can help relieve anxiety and stress associated with problem solving."*
>
> *([illegible] & Lacey, 2004, p. 77)*

Recent research on teaching math problem solving in both classroom-level studies and tutorial studies has revealed several important findings for the instruction of math problem solving. Outcomes for children across ability levels and for children with specific difficulties in mathematics are improved when math problem-solving instruction is *overt, systematic and clear, and scaffolded by the teacher and peers.*

A problem-solving approach is essential for actively involving students in stimulating activities that present challenges and in which they use a variety of representations (concrete, visual, diagram models) to reach an in-depth understanding of mathematics.

The problems presented to students in a problem-solving approach are more than just word problems. They are situations that allow students to explore concepts, use prior knowledge, acquire new knowledge, reason, communicate ideas, and make connections in relevant and engaging contexts. "Problem solving is not only a goal of learning mathematics but also a major means of doing so" (National Council of Teachers of Mathematics, 2000, p. 52).

Students often use concrete or visual representations to solve problems and communicate their explanations or strategies to others. To put this another way, teachers should encourage the use of open problems that enable the use of a variety of strategies and answers. "Metacognitive skills such as reflecting, organizing, and structuring … enhance student learning and student retention of important content because they help students create their own connections with knowledge" (Ornstein & Lasley, 2004, p. 281).

Important considerations

Before presenting the problem, consider:

- the context: Is it relevant, engaging, and familiar to students?
- strategies students will need to solve the problem: Are students familiar with at least one of the possible strategies that can be used to solve the problem?
- groupings: Mixed-ability groupings can support struggling students and challenge more able students.

When presenting the problem, consider:

- using visual prompts and modelling the use of appropriate math language;
- repeating information and instructions several different ways;
- having students restate the problem to ensure that they understand it.

While students are solving the problem, consider:

- working with students individually or in a small group to get them started;
- modelling an efficient problem-solving strategy and then asking students to solve the problem on their own;
- providing a checklist to help students stay on track;
- using think-aloud to help students reason through the process;
- modelling how students can represent their thinking using graphic organizers, pictures, lists, concrete materials, procedural writing, or verbal explanations;
- how students can best represent the process and solution, and allow for choice.

When reflecting and consolidating with students, consider:

- using probing questions to help students communicate their understanding;
- referring to previous problems and contexts to help students make connections;
- using think-aloud and concrete materials to model the thinking process through the problem-solving stages.

Table 6. How to Teach Through Problem Solving: A Concrete Example

Phases of effective instruction	Student areas of need that may have an impact on the effectiveness of instruction	Considerations for implementation
1. Getting started		
The teacher: • presents the problem and gives the information needed to solve the problem; • gives instructions for completing the task; • activates prior knowledge; • engages students through contextual information or an interesting situation. At this point – just before they begin the task – the students understand the problem and the teacher's expectations.	• Prior knowledge and experience (i.e., Does the student have the math knowledge and skills needed to complete the task? Has the student completed a similar task before?) • Language abilities (i.e., Does the student have the ability to process information and make connections?) • Metacognitive abilities (i.e., Can the student keep track of the instructions and information?)	• Refer and make connections to problems that students have experienced before. • Use contexts that students are familiar with and are interested in. • Refer to the *math word wall* and *math strategy wall** to remind students of previous learning. • Provide visual prompts to illustrate the task. • Repeat the information in different ways and ask students to describe the problem in their own words, using their own representations. • Provide a step-by-step checklist or graphic organizer. • Provide the instructions in manageable chunks. • Use *think, pair, share** to generate strategies and approaches.
2. Working on solving the problem		
The teacher guides, assists, observes, asks questions, redirects, adjusts groupings, modifies the task. Students: • may be working independently, in pairs, or in small groups; • may be in flexible groupings; • are using materials/manipulatives appropriate for the task; • are trying/testing their own strategies.	• Metacognitive abilities (i.e., Is the student able to identify and select appropriate strategies? Is the student able to select and use appropriate manipulatives?) • Self-regulation (i.e., Is the student able to organize what he or she has done and then provide a recording of it?)	• Consider grouping students to support different levels of ability: – Pair students to model different strategies and approaches. – Work with students individually or in small groups to get them started, or to model one possible strategy or solution. – Change groupings to meet needs. • Restate the problem and instructions. • Give students a strategy to try. • Check in with students regularly to keep them on task. • Provide an outline of how the solution is to be recorded. Use *mind mapping* and *procedural writing** to help students organize their thinking. • Model the use of manipulatives to represent the problem or solution. Provide alternative materials.

* These strategies are described in Table 8.

Table 6. How to Teach Through Problem Solving: A Concrete Example (continued)

Phases of effective instruction	Student areas of need that may have an impact on the effectiveness of instruction	Considerations for implementation
2. Working on solving the problem (continued)		
		• Model how to make a recording of each step of the process. Use *think, talk, write*, and *place mat** to help students make a written recording of their work. • Model the use of pictures and diagrams. • Allow students to represent their solution orally. • Use *cooperative problem solving** to have students work collaboratively in groups.
3. Reflecting and connecting		
• Students share multiple strategies and solutions to help consolidate learning. • The teacher asks questions to facilitate and direct the discussion based on the goals of the lesson and what the students know and need to know.	Language abilities (i.e., Is the student able to process information, make connections, and express ideas and solutions?)	• Use a think-aloud to model and help students to: – verbalize math thinking; – use math vocabulary appropriately; – ask questions; – make connections to other problems and contexts. • Provide prompts or sentence starters for sharing. • Use *show and tell, math readers' theatre*, and *mathematician's chair** to have students share their solutions and strategies. • Refer to the *math word wall* and *math strategy wall** to help students use math vocabulary and describe strategies when sharing.

* These strategies are described in Table 8.

Instructional Approaches

> *"Children benefit from a thoughtful combination of carefully planned sequences of activities and of integrated approaches that occur throughout the day."*
>
> *(Clements, Sarama, & DiBiase, 2004, p. 60)*

Teachers should consider an appropriate balance of shared, guided, and independent mathematics, which together create an environment where all students have the opportunity to learn concepts and skills. Each of these approaches could present challenges for some students, and their specific learning needs should be considered when planning for these experiences. Appropriate social skills must be in place and/or should be taught before these approaches may be used effectively for all students.

Shared mathematics

Students work in pairs or in small groups, participating collaboratively in learning activities. This approach:

- provides opportunities for students to learn from one another;
- encourages discussion and sharing of ideas;
- involves students in working collaboratively to solve a problem or investigate a mathematical idea.

Students learn from one another with guidance from the teacher. Shared mathematics promotes the development of problem solving, reasoning, and communication skills.

Peer-assisted learning strategies (PALS)

This is a cooperative instructional approach that enables students to make connections with abstract mathematical concepts. It is useful for helping students:

- understand problems;
- communicate mathematical reasoning;
- construct meaning;
- experience a variety of solutions and strategies.

PALS is explained in more detail in Chapter 6 of this report.

Guided mathematics

The teacher models and guides students through a mathematical skill or concept to:

- reinforce the specific skill or concept;
- work on new skills or concepts required to solve a problem;
- introduce a specific process;
- model mathematical language, thinking, and problem solving.

This instructional approach involves student–teacher interaction. Students should be participating, asking questions, sharing ideas, and offering suggestions. Teachers help students to make connections with prior knowledge, leading and guiding the discussion.

Teachers not only model specific mathematical processes, they also model cognitive and metacognitive strategies used to solve problems (Hutchinson, 1993; Montague, 1993).

Think-aloud

One strategy that may be used by teachers during guided mathematics is think-aloud. Teachers:

- verbalize the thinking and decision-making processes;
- demonstrate the questions they would ask themselves;
- demonstrate the importance of reflecting on their strategies;
- model mathematical language;
- monitor student understanding throughout the process.

Teachers should systematically plan for a think-aloud. It should allow for demonstrations, modelling, feedback, and time for students to conceptualize.

(Miller, Butler, & Lee, 1998)

Students see, hear, and feel mathematical language, thinking, and problem-solving strategies in a meaningful context. Explicitly teaching both cognitive and metacognitive strategies has been found to be effective when teaching students with special learning needs (Montague, Applegate, & Marquard, 1993; Hutchinson, 1993; Cassel & Reid, 1996).

When planning a guided mathematics lesson for a mixed-ability regular classroom, teachers need to consider the following:

- Which strategies should be used to address the different needs and learning styles of the students? Would visual representations, for instance, benefit the learning needs of the students in the class?
- Which strategies will help keep all students engaged? Would using concrete materials during the lesson keep students engaged? Would alternating teacher-led instruction and student exploration within the lesson help engage students?

Table 7. A Sample Grade 1 Guided Mathematics Lesson

Component	Considerations when working with students with special needs
Content/Curriculum Expectations	
• Investigate number meanings. • Use concrete materials to help in solving number problems.	• The lesson may need to be modified or accommodated for some students. • Some students may need to work with smaller or larger numbers.
Materials	
• Transparent counters • Transparent five frames • Overhead projector • Five frames for each student or pair • Five red counters, five blue counters for each student or pair	• Select concrete materials most appropriate for each student: – for students with fine motor difficulties: larger counters and electronic manipulatives – for students with visual impairments: counters of different shapes or textures • Some students can work with a smaller quantity of counters (e.g., three), while others can be challenged with larger quantities.
Phase 1. Getting started	
Work with the whole group or a small group of students. Ask students to hold up their fingers. Say: "Show me two fingers. Show me five fingers. Show me four fingers …" Repeat this activity several times. Place a group of three red counters and a group of two blue counters on the overhead projector. Ask: "How many blue counters are there? How many red counters are there? How many counters are there altogether?"	• Select the most appropriate strategies for each student: – For students with difficulties processing information or concentrating: use paired or individual instruction. – For students with language difficulties: show the required number of fingers after the response is modelled by the teacher or another student. – For students with problems controlling physical movements: represent the quantity using concrete materials or assistive technology. – For students with auditory or visual processing difficulties: seat students close to the projector; repeat instructions and questions, express them in different ways.

Component	Considerations when working with students with special needs
Phase 1. Getting started (continued)	
	• Repeat instructions to increase comprehension and memory. • Allow students to approach the projector to touch and count the counters. • Use a context for the counters, such as putting strawberries (red counters) and blueberries (blue counters) in a basket. • Show the same number of fingers as counters to show one-to-one correspondence (e.g., show four fingers, then show four counters). • Point to the counters when asking a "how many" question.
Phase 2. Working on it	
Place a five frame on the overhead projector. Ask the students to count the spaces. Place two blue counters in the frame. Ask, "How many blue counters are there? How many empty spaces are there?" Place three red counters in the frame. Ask, "How many red counters are there? How many counters are there altogether?" Ask each of the students to place given numbers of counters in the five frame. If a student puts four red counters in the frame, say, "How many empty spaces are there? Then, how many blue counters will I need to fill the five frame?" Give each student or pair a five frame and the red and the blue counters. Say: "Use your five frames to make as many different combinations of red and blue counters as you can. The rule is that the reds have to stay together and the blues have to stay together. You can't mix them up." *Independent work:* Students work independently to place the various combinations of counters on the five frame. Circulate around the classroom to ensure students are able to do the task. Ensure that students have ready access to manipulatives and other supports, such as math word walls, examples of similar problems students have worked on previously, and so on.	• Provide several examples of placing and counting the counters and blank spaces on the five frame before asking students to do it on their own. • Pair a less capable student with a more capable student to scaffold learning (PALS). • Demonstrate how to make a combination, using two different colours or counters while talking the process through, using a think-aloud. • Leave an example of one combination for students to refer to. • Some students would benefit from getting a new five frame after each combination is represented. • Provide a ten frame, ten red counters, and ten blue counters for those students working with larger numbers. • Check in frequently with students to keep them on task; provide scaffolding when needed; reconfigure groupings to meet needs. Use questioning to ensure understanding.

(continued)

Component **Phase 3. Reflecting and connecting**	Considerations when working with students with special needs
Discuss students' results with the red and blue combinations. Have students make different combinations on the overhead projector. Draw up a chart that shows all the combinations.	• Use think-aloud to model for students how to show the different combinations of counters: "First I put two red counters on the five frame. One, two. There are one, two, three blank spaces, so I will need three blue counters to fill it up: One, two, three blue counters. I have two red counters and three blue counters." "Now I will count all the counters to make sure I have five. One, two, three, four, five." • Provide sentence starters for students as they present their combinations. • Ask questions to help organize student thinking. – "What did you do first?" – "How did you know how many blue counters you needed?" – "Then what did you do?" – "How did you know you were right?" • To help students make connections ask: "Does this remind you of another problem we've done before?" • When recording the different combinations in chart form, include pictures, numbers, and the different colours or shapes to help students record what they have done.

(Adapted from Ontario Ministry of Education, 2004a, p. 4.11)

Independent mathematics

Students work independently to focus on and consolidate their own understanding. Independent mathematics provides opportunities for students to:

- develop, consolidate, or apply strategies or skills on their own;
- make choices independently;
- work at their own pace and develop independence, perseverance, and self-confidence;
- demonstrate what they know and can do.

Although students are working independently during independent mathematics, they may ask their peers or teacher for clarification or feedback. During this time, the teacher will take the opportunity to observe, ask questions, and record information about students' understanding, strategies, procedures, skills, and knowledge.

Communication and Mathematics Learning

> *"Writing and talking are ways that learners can make their mathematical thinking visible."*
>
> *(Whitin & Whitin, 2000, p. 2)*
>
> *"Communication in the Math classroom is an indispensable and necessary means of teaching. However, to be effective, communication must make full use of the mathematical reasoning and arguments that relate to the concepts being taught."*
>
> *(translated from Radford & Demers, 2004, p. 16)*
>
> *"…communication should be viewed not as a mere aid to thinking, but as almost tantamount to the thinking itself."*
>
> *(Sfard, 2001, p. 13)*

Students must focus their communication efforts on mathematical reasoning. Teachers ask students to communicate so that they may understand students' thinking and use this information to inform instruction. Discussions allow students to:

- build understanding and consolidate learning;
- ask questions, make conjectures, share ideas, suggest strategies, and explain their reasoning;
- learn to discriminate between effective and less effective strategies.

Research in the field of math communication can be grouped into two main trends (Lambert & Cobb, 2003). Some research considers math communication to be a skill that students must acquire. Other research considers communication to be one of the consequences when a community of learners focus on improving their understanding of mathematics.

Teachers help students develop oral, written, and reading comprehension skills by:

- providing tasks that are worth talking and writing about;
- modelling think-aloud techniques and encouraging students to do the same (e.g., "I have 25 and need to subtract 7 but don't have enough ones so I need to regroup.");
- modelling the use of mathematical language;
- modelling how questions can be answered;
- asking good questions and encouraging students to reflect on their thinking and ask their own questions;
- providing feedback;
- asking "How do you know?"

Table 8. Teaching Strategies That Promote Communication

Oral communication strategies	Student areas of need that may have an impact on the effectiveness of the strategy	Considerations for implementation
Think, Pair, Share		
Students independently consider a task, strategy, and so on, then pair with another student and share ideas. Two pairs then join each other to discuss further.	• Language abilities (i.e., the ability to process information, make connections, and express ideas and solutions) • Prior knowledge and experience (i.e., level of content knowledge required to complete the task)	• Consider pairings that support different levels of language ability. Pairings should: – model good language; – challenge thinking. • Provide visual prompts or sentence starters to keep pairs on task. • Consider tasks that support different levels of understanding. – Pair a capable student with a less capable student to scaffold learning. – Pair students of similar abilities to consolidate or extend learning.
Show and Tell		
Students explain the task to one another, build a representation of the solution, then share their work through pictures, words, or diagrams (Dacey & Eston, 2002).	• Cognitive abilities – being able to represent thinking in concrete ways • Metacognitive abilities – identifying and selecting appropriate strategies, organizing information • Language abilities (i.e., the ability to process information, make connections, and express ideas and solutions)	• Provide models of how to describe and show thinking concretely: "I found the total number of buttons by putting them into groups of ten. And then I counted 10, 20, 30, 31, 32, 33." • Provide a checklist that describes the steps in the process. • Provide a template to help organize work. • Provide a framework for showing and telling that might include prompts or sentence starters.
Math Readers' Theatre		
Students create a script to describe a concept, then act it out.	• Language abilities (i.e., the ability to process information, make connections, and express ideas and solutions) • Metacognitive abilities – identifying and selecting appropriate strategies, organizing information	• Provide concrete materials for students to use while acting out their steps for solving the problem. • Provide a structure for students to use when creating their scripts or storyboards.

Oral communication strategies	Student areas of need that may have an impact on the effectiveness of the strategy	Considerations for implementation
Mathematician's Chair		
Students prepare a problem, then share it with the class or small group.	• Language abilities (i.e., the ability to process information, make connections, and express ideas and solutions) • Self-regulatory abilities (i.e., the ability to plan, organize information to create and solve a problem, and then share the solution)	• Model what and how to share using think-aloud. • Use a graphic organizer to model the steps needed to solve a problem.
Cooperative Problem Solving		
Each student in a group of two or four is given a clue to a problem. The students share the clues and solve the problem together.	• Working memory (i.e., the ability to remember all the clues to the problem)	• Provide students with all the clues to the problem, not just their own.
Catch the Mistake and Make it Right		
A puppet counts and makes many mistakes. Students catch the mistakes and correct the puppet (Clements & Callahan, 1983).	• Language abilities (i.e., the ability to process information, identify the mistake, and then correct the mistake)	• Provide models and/or manipulatives to represent what the puppet is saying and doing.

(continued)

Table 8. Teaching Strategies That Promote Communication (continued)

Written communication strategies	Student areas of need that may have an impact on the effectiveness of the strategy	Considerations for implementation
Mind Mapping		
The teacher records ideas about a concept using key words. He or she draws a mind map showing how the ideas are connected.	• This is a good strategy for all students.	• Provide blank or partial templates to help students organize their thinking. • Use concrete maps.
Think, Talk, Write		
The teacher gives students a problem/question/prompt to think about. Students take turns in small groups to talk about their ideas. Students then write a response.	• Language abilities (i.e., the ability to process information, make connections, and express ideas and solutions orally, then in writing) • Prior knowledge and experience (i.e., level of content knowledge required to complete the task)	• Consider pairings that support different levels of language ability. • Model mathematical language. • Challenge thinking by asking "How do you know?" • Utilize visual prompts to keep pairs on task. • Provide written prompts or sentence starters for sharing. • Consider pairings that support different levels of understanding: – Pair a capable student with a less capable student to scaffold learning. – Pair students of similar abilities to consolidate or extend learning.
Place Mat		
Students work in groups of four. Each student records responses in one quadrant of a large sheet of paper. A summary of all responses is written in the centre of the paper (Bennett & Rolheiser, 2001).	• Prior knowledge and experience (i.e., level of content knowledge required to participate in the task)	• Consider groupings that support different levels of understanding: – Group capable students with less capable students to scaffold learning. – Group students of similar abilities to consolidate or extend learning.
Graphic Organizers		
Students use Venn diagrams, flow charts, and T-charts to arrange information visually.	• Self-regulation (i.e., the ability to know when to use an organizer, how to use it, and how to evaluate its effectiveness)	• Model the appropriate use of different types of organizers. • Provide examples of different forms.

Written communication strategies	Student areas of need that may have an impact on the effectiveness of the strategy	Considerations for implementation
Math Word Wall and Math Strategy Wall		
Students refer to math vocabulary and problem-solving strategies posted in the classroom while making oral and written responses.	• Working memory (i.e., the ability to keep in mind the words and strategies needed while completing a writing task)	• Review vocabulary and strategies often. • Provide examples of how the words and strategies are used. • Colour code, classify, or group words and strategies for easier reference.
Journals/Logs and Procedural Writing		
Students represent their understanding of mathematical concepts by contributing responses, explanations, and reflections using pictures, numbers, and/or words.	• Self-regulation (i.e., the ability to organize what has just been experienced and then provide a recording of it) • Working memory (i.e., the ability to hold in mind what to write, the grammar needed to write, and the style to use)	• Provide sentence starters, outlines, models. • Model the use of pictures and diagrams. • Teach the writing form using different examples and contexts. • Provide a checklist of the content to be included in the journal/log/procedure.
Math Picture Books		
Students write and illustrate a picture book individually, in pairs, or as a whole class to explain a concept.	• Self-regulation (i.e., the ability to plan and organize an entire story)	• Provide a model using published picture books. • Provide think sheets for planning.
Poster Projects		
Concepts are represented in poster form using pictures, diagrams, and written explanations.	• Self-regulation (i.e., the ability to plan and organize a poster)	• Provide examples; use picture supports.
Students' Problem Posing		
Students write their own problems and share them with the class (Sliva, 2004).	• Language abilities (i.e., the ability to process information, make connections, and express ideas and solutions in writing, then orally)	• Provide a checklist for students to use to write their own problems. • Model what and how to share, using think-aloud.
Math Creative Writing		
Students write about mathematical concepts or experiences using prompts or sentence starters.	• Language abilities (i.e., the ability to process information, make connections, and express ideas and solutions in writing)	• Have students work with the teacher or another student to complete the writing task. • Model a response using the same prompt given to the student.

(continued)

Table 8. Teaching Strategies That Promote Communication (continued)

Reading comprehension strategies	Student areas of need that may have an impact on the effectiveness of the strategy	Considerations for implementation
Retell, Reflect, Relate		
Students answer questions before, during, and after the reading of the problem or task.	• Language abilities (i.e., the ability to make connections, use vocabulary, and express thinking) • Working memory (i.e., the ability to hold in mind important information from the text)	• Use alternative forms of presentation (oral: discuss the problem; visual: present the problem in a picture). • Discuss new vocabulary (add to math wall). • Provide students with an advanced organizer about problem-solving procedures. • Use concept mapping (Barton & Heidema, 2002).
Mental Imagery		
Students try to represent the problem through the use of images.	• Working memory (i.e., the ability to hold in mind important information from the text) • Prior knowledge and experience (vocabulary)	• Generate an image/drawing. • Act out the problem. • Present the problem to students using different media (e.g., audio, picture) to respond to varying learning styles.
Monitor/Self-check		
Students try to assess the process of problem solving.	• Self-regulation (i.e., the ability to be aware of difficulties; corrective strategies)	• Reward self-checking activities. • Use strategies wall. • Tell what is missing (Bley & Thornton, 1995).

8

Effective Instructional Approaches and Teaching Strategies for Literacy

> *"A child's success in school and throughout life depends in large part on the ability to read. Educators in Ontario have the profound challenge of making reading a reality for all children."*
>
> *(Expert Panel on Early Reading in Ontario, 2003, p.1)*

Literacy includes three basic components: oral language, reading, and writing. Oral communication provides the foundation, but each component influences the others.

Students acquire and/or improve oral language, reading, and writing skills through optimal instruction in the critical processes related to these aspects of literacy. Literacy, in turn, fosters student motivation, increased self-esteem, and love of reading and writing.

Early intervention is crucial for student success in school because literacy skills are the foundation for academic success across all subject areas. The ability to recognize and write words accurately and fluently is an essential building block for becoming an effective reader and writer. Comprehension and communication are the *goals* of reading and writing. Solid literacy skills are necessary for the enjoyment of reading and writing, and reading and writing are the means by which new learning is both acquired and communicated.

Students acquire the components of literacy at various points in their development, including the period before they enter school. They develop oral language skills early, and continue to build on these skills through experience, exposure to language, and instruction. They begin to develop phonological awareness skills in the preschool years.

This chapter touches on important components of literacy, key implications for practice, and specific strategies to consider for meeting the needs of students with special learning needs.

Guiding Principles

To effectively teach literacy skills to a classroom of learners that includes students with special needs, teachers need to understand the following:

- Instructional strategies and content should be based on knowledge of the developmental sequence of literacy skill acquisition.
- Foundational skills and conceptual skills need to be taught concurrently.
- Instruction for both foundational and conceptual skills needs to be delivered systematically, explicitly, and with sufficient intensity and duration.
- Early assessment of children at risk is important for providing instruction that prevents later learning difficulties.
- Ongoing literacy assessment of children with special needs is critical for improving instruction.
- Instruction must be sufficiently varied and balanced to ensure that all students are active participants.

Instructional strategies and content

Research is the foundation on which educators need to base their instructional decisions regarding content and instructional strategies for students with special needs in literacy. Children with reading difficulties can gain literacy skills when provided with evidence-based instructional components. Because every student has unique background knowledge and core literacy skills, it is up to the teacher to identify what the students can do and what skills they need to achieve success. For example, research suggests that students in the early grades who have phonological awareness skills are likely to make greater growth in reading than children who have more limited phonological skills (National Reading Panel, 2000). Hence, instruction should begin with what the student knows (e.g., knowledge of some letters and sounds) and build upon this knowledge with age-appropriate and instructionally appropriate materials.

Foundational and conceptual skills

A range of important skills is necessary for children to grow in literacy. These skills are elaborated in the report of the Expert Panel on Early Reading (2003). Instruction should emphasize foundational skills such as decoding and spelling, and also highlight the purposes of reading and writing. That is, children need to know how to read, but it is equally important for them to know that reading and writing provide them with enjoyment, information, and opportunities to share and communicate their ideas.

Teachers need to convey to students that they can learn to read and write, and that there are strategies that students can use to support their efforts to gain these critical skills. Instruction needs to be comprehensive and use a variety of approaches. These approaches may have to be more explicit and structured during initial phases of instruction for any particular skill, regardless of age. For example, students may need instruction that boosts their ability to use letter–sound relationships to decode unfamiliar words, and they may need to learn specific strategies that improve their ability to comprehend text. Hence, instruction would concurrently focus on foundational skills such as decoding and higher-order skills such as comprehension. In addition, teachers should ensure that students have ample opportunities to use these skills in context (e.g., reading a text they are interested in, at a level they can comprehend).

Systematic and explicit instruction of sufficient intensity and duration

The instruction that students with special needs receive may not be different in content from that of other students, but teachers may need to deliver that instruction with more support and guidance, with more intensity, and with more opportunities to facilitate growth.

Instructional supports such as guided practice, modelling, coaching, and explicit feedback are particularly necessary for students with special needs in literacy. As students become more adept in a given skill area, such as using a word-solving strategy, the teacher can slowly decrease the level of support to facilitate the child's own independent learning abilities.

Students with special needs often have difficulty using prior knowledge in new situations. Hence, teachers need to guide their students' ability to use their prior knowledge across multiple situations. For example, when teaching a word-solving strategy in one situation, the teacher could provide cues to the student that help the student become aware of other situations when he or she could use this strategy.

Instruction needs to be overt when teaching both foundational and more conceptual literacy skills. Overt instruction includes techniques such as demonstration, modelling, coaching, timely feedback, peer-assisted learning strategies, and so forth.

Early assessment to prevent later reading failure

Research has consistently shown that early identification of students who are at risk for reading failure prevents many of them from experiencing significant reading difficulties in later years. Early identification ensures that those small numbers of students who cannot be adequately served by best-practice classroom instruction receive timely intervention and support.

Profiling the learning strengths and needs of students in literacy (e.g., phonemic awareness, language skills) can provide teachers with a powerful tool. They can use their findings to provide differentiated instruction in large groups, small groups, or at the individual level, and also to monitor students' responses.

Ongoing literacy assessment of students with special needs

As highlighted in previous chapters of this report, teachers need to *continuously monitor students' progress* in all aspects of literacy to drive their instructional decisions. Assessment by the classroom teacher provides information about each student's learning processes and strategies relative to grade-level expectations and specific learning goals for that student. Teachers can use a variety of assessment strategies and tools to gain information about many aspects of literacy skills. (See Expert Panel on Early Reading, 2003, p. 29.)

Balance and flexibility in instruction

In most cases, effective reading instruction for students with special needs is the same as that for students with average achievement levels. The same goals apply: comprehension, communication, and motivation.

Effective teachers will, however, vary instructional strategies and methodologies to provide students with special needs with the increased intensity and duration of instruction they may require. At the same time, teachers need to keep all students engaged and active in the learning process.

Effective teachers do not neglect any part of the reading process. Likewise, while learning gains may vary depending on what is taught, teachers also need to ensure that students with special needs can participate in all aspects of literacy. For example, the teacher may decide to employ decodable books to help struggling readers develop decoding accuracy and fluency. It is equally important, however, to expose these same students to rich and complex language in authentic texts – through read-alouds and shared reading, for example – to meet other literacy-related instructional goals, such as motivation to read and increased vocabulary.

Oral Communication

Society places great value on oral communication, and many of us rely on oral language to express our ideas, feelings, and desires. Language difficulties, therefore, may affect the personal lives of students and their social lives in addition to schoolwork. Students with effective oral communication skills are at an advantage when they begin learning to read. Likewise, students who have gaps in their oral language may have subsequent literacy problems, particularly in reading comprehension and in written communication (Badian, 1982; Giasson, 1995; Saint-Laurent, 2002; Villepontoux, 1997).

For example, students with receptive oral language difficulties may struggle to understand or follow even simple messages or instructions. Students with difficulties at the expressive level often display poor vocabulary and difficulty in expressing their thoughts clearly. Their sentences may also include many syntax errors. Still other students with oral language difficulties show a deficit in pragmatic knowledge of language. They do not know how to intervene verbally with others, and do not understand the implicit rules of conversation (e.g., when to interject, how to take the responses of others into account).

Table 9 provides strategies to help recognize students who may have difficulties with the many dimensions of oral language.

Promoting oral communication

Students with language difficulties are often caught in a vicious cycle. They have difficulty in expressing themselves, in understanding instructions, and in learning to read. Therefore, they limit their reading and avoid writing when written tasks seem insurmountable. Teachers must remember that oral language is intimately related to reading and writing. Opportunities to improve oral language skills must be incorporated in reading and writing instruction.

Table 9. Components of Oral Language

Language dimension	How to recognize students who may be experiencing difficulties
Phonology: The sound system of a language and the linguistic rules that govern its sound combinations	• Delay or difficulty in perceiving or producing complex sounds • Deficiency in awareness of sounds (phonological awareness)
Morphology: The linguistic rule system that governs the structure of words and the construction of word forms from the basic elements of meaning	• Difficulty with verb tenses, possessive determinants, and pronouns • Difficulty in deriving meanings of new words from other known words (e.g., knowing that the prefix *un-* often means "not" as in *unhappy, unkind*)
Syntax: The rules that govern how we combine words or morphemes to make grammatically correct sentences	• Use of shorter and possibly less complex sentences for their age • Difficulty understanding sentences that express relationships between direct and indirect objects • Difficulty understanding the structure of sentences that are not direct statements, such as negative and interrogative sentences • Frequent use of the same sentence structures
Semantics: Closely related to the concept of language meaning, this term is concerned with the meaning of individual words as well as the meaning produced by combinations of words, sentences, and larger chunks of language.	• Difficulty with "word finding" • Difficulty defining literal meaning of words • Difficulty differentiating among words that have a number of meanings • Frequent use of imprecise terms (*that, the thing, stuff*) • Difficulty with relational terms (comparisons, words indicating time or space) • Difficulty integrating ideas within and between sentences • Difficulty integrating prior knowledge with what is heard
Pragmatics: Rules that govern how language is used in social contexts; also referred to as communicative competence	• Tendency to monopolize the conversation • Difficulty interpreting clues in verbal and non-verbal communication • Difficulty in understanding that the hearer does not understand, and tendency to continue talking rather than adapting the conversation

(Based on Mercer & Mercer, 1993)

Before listening or reading activities, teachers should highlight key aspects of language and new vocabulary in all the activities that are related to the exploration of the theme or subject, by:

- preparing graphs or charts;
- the reading of texts by the teacher or other students, or listening to recorded texts;
- looking at illustrations;
- drawing students' attention to unfamiliar words that come up frequently in the text;
- illustrating new vocabulary; and
- having the students read new words.

During reading or listening activities, teachers should encourage students to ask questions and to identify words or concepts that they do not understand.

After reading or listening activities, teachers should encourage students to verbalize what they enjoyed about the text, explain the things they did not understand, and share with others the ways that they solved a problem encountered in the text.

Facilitating oral language development

Language interventions should be based on the regular curriculum, reflect the areas of study, integrate oral and written language, and emphasize using language in new situations. Language skills should be taught in meaningful contexts and take into account phonological, syntactic, semantic, and pragmatic aspects as well as cognitive and social skills. Using real or simulated situations or role-playing games helps students understand the usefulness of communication and provides variety in the types of discourse they use.

Classroom activities involving language can include all learners, with appropriate considerations for learning strengths and needs. For example, for an activity known as Word Dice, the teacher can make giant dice and write words on them. The students take turns at throwing the dice, and they must provide a synonym, antonym, or definition of the word that turns up. Students are expected to answer according to their particular strengths and areas of need. For example, students might have to select an appropriate synonym from a set of choices. Providing this option would accommodate those who have expressive language difficulties, and make this lesson consistent with both differentiated instruction and universal design for students with average achievement levels.

Building vocabulary

According to the National Reading Panel (2000) review of 47 research studies on vocabulary instruction:

- strategy instruction is very effective in cooperative learning contexts;
- teaching multiple comprehension strategies is strongly recommended, since readers must coordinate several processes in order to get the most out of text;
- students achieve better outcomes with reading comprehension strategies when teachers explain, model, demonstrate, guide, and scaffold the various strategies in the classroom;
- teachers should teach vocabulary both directly (e.g., preteaching of vocabulary necessary for a lesson) and indirectly (e.g., through storybook reading);
- students should have multiple exposures to vocabulary in different contexts;
- vocabulary learning can be most effective for at-risk or low-achieving students when the task is restructured to expand instructional focus beyond definitions of new words (e.g., teaching the components that make a good definition);
- computer technology is effective in vocabulary teaching;
- active engagement promotes vocabulary learning (e.g., student questioning or response during shared book reading; metacognitive strategies for word solving);
- a variety of vocabulary instructional methods are more likely to be effective than only one.

A combination of approaches based on the characteristics of learners, the context, and the skills to be taught (Warren & Yoder, 1994) is also recommended. In addition, modelling, expansion techniques (i.e., reformulating the student's statement without adding information), and extension techniques (i.e., adding information to the student's statement) are effective strategies.

To help students improve their language comprehension (receptive language):

- Hold and keep the students' attention when presenting the information.
- Require students to repeat the instructions.
- Introduce new concepts using a variety of media (visual, audio, or kinesthetic), and use concrete materials, gestures, and so on.
- Help students understand that listening is an active process in which they must get involved.
- Identify the behaviours associated with good listening.
- Vary the complexity of spoken instructions to allow all levels of students to understand.
- Adjust your speed of speaking and level of language.
- Read, mime, repeat, and illustrate stories (e.g., through drawings, pictures).

To help students increase language production (expressive language):

- Create numerous opportunities for conversation – with the teacher and with other students.
- Ensure that the subjects of conversation are of interest to the students.
- React positively to the content of what students say.
- Use communication games (e.g., role playing, simulation).
- Ensure that students who cannot speak have access to appropriate technology (computers, voice synthesizers). (See Chapter 10.)

Reading

Reading comprehension

Without a doubt, reading comprehension represents "the essence of reading" (Durkin, 1993). Comprehension is an intentional, inferential, problem-solving interaction between the reader and the text. What the reader ultimately gleans in constructing meaning depends on the content and difficulty of the text, as well as his or her prior knowledge and relevant experiences (Anderson & Pearson, 1984).

Some students may acquire an implicit knowledge of how to read strategically to maximize the uptake of information from text, but many students with special needs struggle. Adequate decoding abilities and reading fluency may not guarantee that the student can get the most out of the text that he or she is reading. Students who experience weaknesses in comprehending what they read can do so for a range of reasons. Research suggests that problems in reading comprehension often are associated with:

- general language weaknesses such as impairments in vocabulary development and oral language comprehension (Lyon et al., 2003);
- poor decoding ability (National Reading Panel, 2000);

- weaknesses in higher-order metacognitive processes (even if the student has accurate and fluent text-reading ability) (Lyon et al., in press);
- little background knowledge in a particular domain (Garner, Alexander, & Hare, 1991).

Teachers can instruct students in a number of reading comprehension strategies that can improve their understanding and retention of meaning from text.

One of the chief goals of reading comprehension is to acquire new knowledge and understanding through reading, or "reading to learn" (Chall, 1996). Therefore, it is important to realize that overall language abilities may limit the degree to which readers can comprehend text. In light of this, instruction should proceed on two fronts:

- **Further development of conceptual and vocabulary knowledge in spoken language.** Learning new vocabulary is intimately tied to reading comprehension. Students can organize their knowledge associated with a subject, theme, or concept by listing the words that directly relate to it and by using concept maps or word constellations. Teachers can promote comprehension by highlighting and preteaching new vocabulary in texts.
- **Comprehension of written text.** The ability to construct meaning from text requires readers to make connections between words, sentences, and paragraphs. They need to make inferences about facts, motivations, and prior events, and successfully identify to whom the writer is referring when using pronouns such as *he* and *they*. Failure to grasp these components of text is likely to lead to comprehension breakdown, so teachers should be prepared to explicitly teach these aspects of reading comprehension. Table 10 includes effective strategies from *A Guide to Effective Instruction in Reading, Kindergarten to Grade 3* (Ontario Ministry of Education, 2003b) as well as possible challenges the teacher may need to address, suggestions for implementation, and benefits to students with special needs.

Table 10. Instructional Strategies for Reading Comprehension

Reading comprehension strategies	Challenges	Suggestions when implementing strategies	Potential benefits when this is taught
Activate relevant prior knowledge (e.g., brainstorming)	• Students may not possess relevant knowledge. • Students may not recognize that their prior knowledge is inconsistent with new information. • Students may be unable to make connections between prior knowledge and new information.	• Provide relevant knowledge (e.g., film, text, manipulatives). • Structure brainstorming activities (e.g., graphic organizers, question prompts, sentence starters) so that relevant knowledge is activated and inaccurate knowledge is not. • Use graphic organizers or other tools to document prior and new knowledge (e.g., Know-Wonder-Learn chart). • Revisit predictions.	Readers improve their memory and comprehension of text.

Reading comprehension strategies	Challenges	Suggestions when implementing strategies	Potential benefits when this is taught
Retell, reflect, relate: Question answering before, during, and after reading	• Students may not comprehend the main ideas of text. • Students may not recognize connections in text. • Students may not be able to formulate appropriate/relevant questions. • Students may not be able to make inferential connections to idiomatic expressions.	• Use alternative forms of expression (e.g., story boards, pictures). • Provide students with external references to support needs in vocabulary (e.g., teacher-produced cues, student dictionaries). • Preteach vocabulary. • Provide students with advanced organizers. • Provide students with generic question prompts. • Provide students with opportunities to reread/look back if they experience difficulty retaining the entire text.	Readers improve their ability to answer and generate inferential questions.
Recognize text structure	• Students may not recognize/ be familiar with all text types. • Students may lack familiarity with text features (e.g., table of contents, glossary). • Students may not be able to differentiate among text types. • Students may not be able to identify text structure.	• Provide students with examples and names of different text types. • Compare and contrast different text structures. • Provide environmental supports for text types and features. • Provide students with graphic organizers for specific text types.	Readers learn to identify and recall different text structures.
Synthesize/summarize	• Students may not be able to retain information from text. • Students may not be able to identify/differentiate main ideas. • Students may not be able to paraphrase.	• Teach students how to deduce main idea (Brown & Day, 1983): 1. Delete trivial information. 2. Delete redundant information. 3. Substitute individual instances for general categorical label (apple, pear, plum = fruit). 4. Substitute individual actions for a categorical label. 5. Select/invent topic sentence. • Encourage students to verbalize thoughts about passage.	Readers improve their ability to identify and recall main ideas in text.

(continued)

Table 10. Instructional Strategies for Reading Comprehension (continued)

Reading comprehension strategies	**Challenges**	**Suggestions when implementing strategies**	**Potential benefits when this is taught**
		• Provide students with opportunities to review previous materials. • Present materials to students across multiple media (e.g., videos, audio recordings). • Provide students with structure and guides when reviewing materials.	
Use mental imagery	• Students may not possess relevant prior knowledge. • Students may not possess adequate memory capacity. • Students may not use imagery.	• Provide students with external references/supports (whole or partial pictures). • Guide students in the generation of an image. • Present materials to students across multiple media (e.g., videos, audio recordings) • Have students draw images. • Reduce the amount of information contained in an image.	Readers improve their memory and comprehension of text.
Monitor comprehension	• Students may be unaware of when they are experiencing difficulties. • Students may be unwilling to attempt corrections. • Students may not possess corrective strategies. • Students may not be aware that strategies can improve comprehension.	• Require self-checking (e.g., use checklists, reflection). • Provide students with credit for self-checking activities. • Model comprehension monitoring by speaking aloud so that students can observe (e.g., "The first part of the text said there are three types of sea lions, but I only remember two; I think I should go back and reread that part again.").	Readers learn to monitor how well they comprehend and how to repair breakdowns in comprehension

Reading fluency

A fluent reader can read text quickly, accurately, and with expression. Fluent readers recognize words automatically, and also group them together into grammatical phrases that aid interpretation and comprehension (Schreiber, 1987). Children who exhibit weaknesses in word recognition, however, tend to read text slowly and inaccurately (Torgesen et al., 2001). In turn, this lack of fluency can negatively affect reading comprehension because the slow reading rate puts too high a demand on children's ability to both decode and remember what has been read (National Reading Panel, 2000).

One of the key reasons for providing opportunities for reading practice is to build fluency. We know that students who are in the most need of practice are those who spend the least time reading (Allington, 1977). Fluency brings the ability to read with the least amount of effort, and, hence, this may increase students' motivation to read. The report of the National Reading Panel (2000) and data from recent reviews (e.g., Kuhn & Stahl, 2003) indicate that there are effective ways to improve fluency. These practices include *guided oral reading practice* and *repeated readings*.

Some or all of the following instructional strategies could increase reading fluency:

- **Guided reading groups.** The teacher provides guided oral practice to groups of students at the same level of fluency, using text that is at the students' independent reading level.
- **Choral reading.** Students read text together in a group. This also allows for repeated reading, although it may be difficult to offer feedback to individual students.
- **Peer-assisted learning.** Pairing students of mixed reading abilities offers a good model for the provision of feedback (Mathes & Fuchs, 1993).
- **Reading while listening** (Rasinski, 1990). A student who experiences anxiety reading aloud before others can use an audiotape of another person reading the passage fluently as a model; the student can read the text aloud while listening to the tape. In promoting this strategy, the teacher should take care to record the model reading at a speed that is fluent, but not too fast for the student to maintain pace.
- **Maintaining interest and motivation through repeated reading.** This should be teachers' key objective. For example, Readers' Theatre provides an opportunity for students to practise their "lines" many times to perfect their "performance". Similarly, a student who is distracted by the voices of others may be willing to read a passage several times if his or her goal is to record it on audiotape as if he or she were a radio announcer.

The oral reading practices recommended here do not include round-robin reading in which each student reads a paragraph of a text. Round-robin reading does not provide any one student with enough sustained reading aloud to be of any benefit, and often does not provide feedback. In addition, it takes up a considerable amount of instructional time and can engender feelings of anxiety among struggling readers (Stallings, 1980).

Free personal reading time for silent reading in materials of choice, also known as DEAR (Drop Everything and Read) or USSR (Uninterrupted, Sustained, Silent Reading), has not been shown to yield measurable effects on reading outcomes for all children (Expert Panel on Early Reading, 2003; National Reading Panel, 2000). Children may learn from this approach that reading is a valued activity, but it has not been found to be a chief instructional approach for building reading fluency.

Phonological awareness

Phonological awareness: The ability to reflect on and manipulate chunks of sounds that are smaller than the word. Syllable awareness, rime awareness, and phonemic awareness are all types of phonological awareness.

Phonemic awareness: The ability to reflect on and manipulate the individual speech sounds (phonemes) in a word.

Phonics: A method of instruction that teaches the relationships between and among letters and sounds.

(Scarborough & Brady, 2002)

Phonological awareness is known to be important for the development of later reading skills, and its lack is a powerful predictor of reading difficulties (Rayner, Foorman, Perfetti, Pesetsky, & Seidenberg, 2001). Students at risk for reading failure tend to lack *phonemic awareness abilities* (National Reading Panel, 2000; Wagner et al., 1997) and thus exhibit great difficulty using phonemic decoding skills to identify unknown words in text (Ehri, 1998). Children's performance on *phonological awareness* tasks is highly related to their later development of word-reading skills (Wagner et al.).

Phonological awareness follows a developmental schedule. Children are aware of syllables before they become aware of smaller chunks. This is known as onset–rime awareness (e.g., the word *black* is comprised of *bl* [onset] and *ack* [rime]). The next developmental stage is the awareness of phonemes, the smallest units of speech.

Teachers therefore need to remember that phonological awareness has to do with sounds, not letters. To illustrate this concept, think about the number of sounds in the words *rich* and *pitch*. Although *pitch* has more letters than *rich*, both words contain three phonemes or individual speech sounds.

Both rime awareness and phonemic awareness are related to later reading skills, but phonemic awareness has the strongest relationship with reading development. In fact, reading and phonemic awareness enjoy a "bootstrapping" relationship, more formally known as *reciprocal causation* (Stanovich, 1986). Essentially, advances in one domain facilitate advances in the other, fostering further interdependent growth of both.

One can most effectively teach and assess phonological awareness along a continuum of difficulty (see Figure 7). Easier phonological awareness activities are generally taught to less skilled readers, while more difficult or complex activities are taught to more skilled students. Teachers should establish that students have the ability to do the easier activities before teaching or assessing the harder ones.

Figure 7. The Continuum of Difficulty for Teaching Phonological Awareness

Least difficult → Most difficult

Judging whether words share the same initial sound:	**Blending onset–rime units:**	**Blending phoneme units:**	**Deleting a phoneme and saying what word remains:**	**Segmenting words into phonemes:**
"Do 'pick' and 'dog' begin with the same sound?"	***"What word do you get if you blend 'b' and 'ag' together?"***	***"What word do you get if you blend 'd', 'o', 'g' together?"***	***"What word do you get if you take off the 'f' from flag?"***	***"Tell me all the sounds in the word 'rake'."***

(Based on Schatschneider, Francis, Foorman, Fletcher, & Mehta, 1999)

The National Reading Panel (2000) reported the results of a meta-analytic study that distilled the important knowledge about phonemic awareness that teachers should know:

- **Phonemic awareness can be taught.** Instruction in phonemic awareness is successful in a variety of contexts and with a variety of learners.
- **Instruction in phonemic awareness leads to improved reading outcomes.** The benefit of phonemic awareness training is even more dramatic for at-risk students than for students with average achievement levels.
- **The younger the students who receive phonemic awareness training, the stronger the benefit.** This underscores the importance of early identification and programming for students who appear to be at risk for reading challenges.
- **Blending and segmenting of speech sounds are the most effective types of activities for improving phonemic awareness levels.** Programs with activities that require many different types of phonemic awareness activities are less powerful than those that are restricted to blending and segmenting speech sounds. This focus allows students to consolidate these important skills; introducing too many activities may require the student to attempt more difficult tasks before the easier skills are consolidated.
- **Teaching phonemic awareness in small groups is the most effective method.** In general, students acquiring phonemic awareness skills in small groups show greater gains than those instructed in individual or whole-class settings.

Word work: Phonics, decoding, and reading sight words

Research indicates that the majority of poor readers have considerable difficulty with *decoding* and *word recognition* skills (Share & Stanovich, 1995; Torgesen, 1999), which in turn can hinder reading comprehension (National Reading Panel, 2000). Early reading programs that incorporate core phonological components (phonemic awareness, alphabetic principle) are successful in preventing reading failure in many at-risk children (Blachman, 2000; Ehri et al., 2001; Lyon et al., in press). Building on the foundation of phonological awareness, students learn that letters correspond to sounds. This allows them to, in effect, break "the code" of alphabetic languages like French and English.

Suggestions to help students address the challenges of phonemic awareness

Teachers can:

- ensure that students have the relevant prior conceptual knowledge (e.g., establish that students understand the meaning of *beginning*, before asking "What sound do you hear at the beginning of *fish*?");
- establish that students can reproduce sounds without articulation difficulties. Such difficulties do not necessarily mean that the student is incapable of *perceiving* the individual speech sounds;
- provide external resources for target words so that memory is not overloaded (e.g., show a picture of a dog when asking "What is the last sound in *dog*?");
- allow students to express knowledge of sounds kinesthetically (e.g., tapping, clapping, moving blocks);
- use manipulatives (e.g., tiles, poker chips, letters) to make the task more concrete.

With explicit and systematic phonics instruction, students with special needs are more likely to acquire the foundational skill of decoding, which is necessary in order to foster fluency and comprehension. This Expert Panel supports the position of the National Reading Panel (2000) that phonics instruction should be integrated into a comprehensive and balanced reading program. Instruction in phonics and decoding should not be conceived of as a total reading program, but neither should it be neglected.

Decoding can be seen as a "self-teaching" mechanism (Share, 1995). From this perspective, every time the student successfully decodes a word, the success of the decoding strategy is confirmed. Repeated successes help to establish the word as a *sight word* in the student's reading vocabulary.

Decoding may be slow and require effort at first, especially for students with special needs. Teachers must ensure that sufficient practice is provided so that letter-by-letter decoding can evolve into fluent and automatic recognition of words.

One way the teacher can help students build fluency is to provide texts containing words that are frequent and that the students can decode accurately. This can be an effective strategy because students need automatic recognition of words in order to develop reading comprehension. Research indicates that the most effective remedial reading intervention programs were those that provided both *direct instruction* (e.g., breaking tasks into small steps, use of feedback, modelling of skills) and *strategy instruction* (e.g., collaborative dialogue, modelling of strategies) (Lovett et al., 2000; Swanson 1999). Reading instruction for poor readers needs to:

- be *explicit, systematic,* and *comprehensive* (target letter sounds, alphabetic principle, word strategies, fluency, writing, and comprehension);
- provide *scaffolding* and *monitoring of progress*;
- be *intensive* (small-group instruction) and of *sufficient duration* (Lyon et al., in press).

Reading always involves both word recognition and comprehension processes, but the balance between word decoding and comprehension shifts with reading experience and reading ability. To understand the relationship between decoding and comprehension, it is useful to consider an analogy – a bank account that contains a limited amount of money. Just as one cannot spend more money than one has in a bank account, students' cognitive resources place a limit on how they are able to comprehend what they read. In other words, students "spend" their cognitive resources while reading text. Beginning readers, and those who have reading difficulties, may have to spend more of their resources getting words off the page, with "less money" (fewer resources) to expend on meaning-making comprehension processes. As reading abilities increase, students are able to read words automatically. Because decoding "costs" very little (it is almost "free"), they can spend most of their cognitive resources on comprehension. This is why instruction in reading for students with special needs must include both higher-order (comprehension) and lower-order (decoding) skills. Instruction in phonics and decoding, therefore, is a very important means to the end goal of comprehension.

Students with special needs may find decoding difficult for a variety of reasons:

- They may lack phonemic awareness.
- They may have working memory difficulties that place limits on the amount of letter-sound knowledge that can be stored before assembly into words.

- They may have specific trouble remembering the many alternative pronunciations for vowels.
- They may get "bogged down" in longer words.

Strategies for teaching decoding to students with reading difficulties

Many of the following strategies teach students to use their metacognitive abilities. These can be effective on their own or in combination.

Synthetic phonics programs. Synthetic phonics programs teach connections between the parts (letter–sound correspondences) and the whole word. Some sounds are taught as complex vowel units, such as *oa* or *ea*. Teaching larger chunks, such as *eam* or *unk*, can cut down on the memory load for words with many letters and sounds. Phonics instruction that is explicitly taught with a scope and sequence is more effective than phonics instruction that is incidental or embedded in other activities (National Reading Panel, 2000; Torgesen et al., 1999).

"Say it and move it". This is a technique in which students slide manipulatives printed with letters down a page as they pronounce each phoneme and then blend the letters and the phonemes together to form a word. This is particularly effective with young students and at-risk readers (Blachman, Tangle, Ball, Black, & McGraw, 1999).

Reading by analogy (Gaskins, Downer, & Gaskins 1986; Lovett & Steinbach, 1997). "If I can read *lake*, then I can read *snake*." This strategy teaches students to examine new words for letter patterns that they already know how to decode, and to apply analogical reasoning to decode them.

"Seek the part you know" (Gaskins et al., 1986; Lovett & Steinbach, 1997). This strategy teaches students to tackle longer words by looking for smaller, familiar words within the unfamiliar word. This encourages students to build on what they know to develop new knowledge.

Writing. When students write, they recruit their knowledge of how words sound. Not only does this process helps crystallize students' knowledge of word spellings, it also provides a diagnostic window for the teacher to determine how students are representing the sounds of speech.

Vary the vowel sound (Gaskins et al., 1986; Lovett & Steinbach, 1997). The sound of vowels and vowel combinations can be quite inconsistent in English; for example, the vowel letter *a* has different pronunciations in *have* and *came*, and in *cap* and *far*. Students are at an advantage if they can be flexible and try out different pronunciations to decode words, but teachers must explicitly teach and model this flexibility.

"Peeling off" (Gaskins et al., 1986; Lovett & Steinbach, 1997). In English, many long words are composed of a root word plus several affixes (e.g., *unhappiness*). Because many students get stymied by longer words when decoding, students can increase their decoding success by learning to "peel off" suffixes and prefixes and look for the root word.

Motivation to read

In order to want to read, students must feel that it is within their capacity. The strategies in this chapter may increase students' reading success. The teacher can go further to encourage reading in his or her students by creating a favourable environment for reading. It is important to provide varied and appropriate resources, including a variety of texts relating to a wide range of interests at a variety of reading levels. Teachers can foster student involvement in reading activities that contain a reasonable and surmountable challenge, alignment with student interest, meaningful tasks, opportunities for interaction, and exchanges about the reading material with peers. In addition, efficient organization of reading-related activities and a physical environment that is conducive to reading (e.g., a reading corner) will help encourage reading during class time.

Writing

Many activities in the day-to-day world involve writing. By capitalizing on this, teachers can construct activities that communicate the importance and meaningful nature of writing to students with special needs.

Writing is an inherently complicated task: students must be able to juggle multiple demands such as formulating ideas, transcribing the information in a coherent and sequential manner, and monitoring spelling and mechanics (e.g., punctuation). Hence, children may experience weaknesses in written expression because of more foundational skill deficits (e.g., spelling, mechanics) and/or because they are unable to juggle the multiple demands of the writing process.

Researchers have studied how to best improve written expression in typically-achieving students and in students with special needs (Englert et al., 1991; Graham & Harris, 1993, 1997; Harris & Graham, 1999; Wong, 1997; Wong, Butler, Ficzere, & Kuperis, 1996).

Graham and Harris (1993, 1997) have consistently shown that students benefit from *explicit instruction in planning strategies* such as *goal setting, brainstorming, semantic webbing,* and *text structure instruction.* When instructing students, teachers model the strategies, and use dialogue to highlight the value, application, maintenance, and generalization of the strategies.

Recent research by Graham and colleagues (Graham & Harris, 2003; Graham, Harris, & Mason, in press) has found that *a more structured and explicit approach can be more effective than a less structured approach* (i.e., writers' workshop) for improving the writing of students with special needs and of students with average achievement levels.

In one study (Graham et al., in press), a self-regulated strategy development program (with and without peer mediation) and a writers' workshop intervention were monitored to determine their respective effectiveness in improving the written expression abilities of struggling writers in Grade 3. In the peer mediation condition, peers worked together to promote strategy use, monitor strategy application, and promote transfer to other situations.

The researchers found that the self-regulated strategy development program with and without peer mediation was *more effective* than the writers' workshop approach in helping struggling writers plan and compose stories and essays. The students who received the strategy-based instruction wrote longer and more complete stories and persuasive essays than students in the writers' workshop condition. Students who received the strategy-based instruction plus the peer mediation component displayed more knowledge of planning and were able to transfer their knowledge to other types of writing genres.

Basic principles to be considered with instruction in writing

Teachers need to consider the following when instructing students in writing:

Balance the need to correct errors with the recognition that exhaustive corrections can discourage a student and place a damper or his or her sense of spontaneity and creativity. The writing of students with special needs tends to be shorter in length than that of students with average achievement levels, resulting in texts with spelling and grammatical errors, lack of organizational clarity, and sparse supporting details.

Help students with language difficulties to connect the way a text is organized with the writing process. During their reading sessions (before, during, and after the reading) discuss text organization and how the writer would have used the writing process.

Establish student groups based on the instructional strategy being used. Different groups can meet specific instructional needs related to writing. Consider heterogeneous groups with mixed ability levels for author's chair, homogenous groups for teaching particular writing points, large groups for independent writing, small groups and pairs for revising and editing.

Provide students with resources. These should include reference materials they can use over time, such as tables on verb conjugation, punctuation, accents, and prepositions; a personal grammar book; and a customized dictionary. These will enable them to find the information they need without needing to ask the teacher every time.

In addition:

- Give students more time to complete writing assignments where necessary.
- Make use of assistive technology to help students organize ideas and reduce motor demands in handwriting, and provide access to word-processing tools such as spellcheckers.
- When students repeat the same error in their texts, explain the rule again and at the same time provide writing exercises so that the students can practise and consolidate the new knowledge.
- Make explicit links between orally produced and written phrases. That way, students can use their oral language abilities to boost their writing skills.

Steps in the writing process

The teacher can begin by helping all students understand the process of preparing to write, through brainstorming, organizing ideas, and drafting a plan together. The students can choose whether to use the plan developed by the group or formulate one on their own. The teacher can then take students through every step of the writing process for a given type of text through a variety of activities (e.g., mini-lessons, modelling, group writing, guided writing).

Ontario schools commonly use the steps in the writing process shown in Table 11. Students with special needs can use these steps productively, especially if the teacher is aware of aspects of the writing process that are challenging for them, and accommodates for learning difficulties.

Table 11. Steps in the Writing Process: Suggestions for Instruction

Challenges that may affect idea generation or brainstorming	**Suggestions for instruction**
• Students may lack relevant prior experiences. • Students may be unable to recognize that prior experiences are relevant. • Students may be unable to express relevant thoughts and ideas coherently. • Students may have a limited vocabulary for expressing thoughts and ideas.	• Select topics that are of personal interest to students: – *Should uniforms be worn at my school?* – *Why should we be allowed to bring toys to school?* • Encourage students to listen and use others' ideas. • Use concrete objects, pictures/diagrams, and mental images as "thought starters". • Use literature and other forms of media as thought starters: – *Write an alternative ending to this story, movie, song.* • Use drama and other kinesthetic activities as thought starters: – *Let's use charades to act out an alternative story ending.* • Use open-ended questions or statements as thought starters: – Students respond to the teacher's or other students' questions or discussion statements. • Use software that supports idea generation.
Challenges that may affect planning for writing	**Suggestions for instruction**
• Students start to write without considering the purpose or the topic. • Students generate irrelevant ideas that do not match the writing purpose or target audience. • Students have difficulty retaining information about the writing purpose or target audience. • Students cannot transcribe their thoughts and ideas in print. • Students do not understand text structure (beginning, middle, end).	• Provide students with questions that direct their attention to the writing purpose and audience: – *To whom am I writing?* – *Why am I writing?* – *What do I know?* – *What should my reader know?* • Provide students with concrete reminders or directions with respect to writing purpose and/or audience. • Ask students to explain the purpose of the writing assignment in their own words. • Provide students with topic-relevant vocabulary. • Provide students with a scribe – a peer, older student, or parent volunteer. • Allow students to audio-record thoughts and ideas or use assistive technologies such as voice recognition. • Provide students with a visual organizer to guide them through the process. • Provide students with an appropriate structure depending on the type of text to be produced (e.g., beginning, middle, and end of the story). • Provide students with a planning template. • Offer a series of chronological pictures.

Challenges that may affect writing	Suggestions for instruction
• Students may not possess adequate vocabulary. • Students are unable to recognize connections between ideas and thoughts. • Students are unable to hold multiple ideas and thoughts in memory. • Students may not understand sequential order. • Students struggle and take extensive time to formulate ideas. • Students may have difficulties producing print. • Students may require excessive amounts of time.	• Provide students with relevant word lists, transition phrases, and partial statements. • Have students recall words orally before writing. • Have students rebuild a text from a set of jumbled paragraphs. • Have students rebuild a text from a set of jumbled sentences. • Provide students with elements of narrative and expository text (e.g., characters, setting, thesis statement, supporting detail). • Use graphic or advanced organizers and/or writing templates (paper or electronic – provincially licensed software). • Use colour to highlight connected thoughts and ideas. • Allow students to audio-record their writing and/or use other assistive technologies (e.g., word processor, voice-to-text software). • Provide students with a scribe (e.g., peer, teacher's assistant, volunteer). • Frequently check the students' work to redirect them promptly and to encourage them.
Challenges that may affect revising and editing	**Suggestions for instruction**
• Students may not possess adequate memory and organizational skills.	• Provide a simply worded correction table. • Make sure the students understand all elements of the table and ask the students to explain it in their own words. • Offer much support at this stage, which is a particularly challenging one for students with learning difficulties. • Make sure the students use toolboxes with properly tailored reference tools (e.g., personal dictionary, grammar rules, verb grid) to facilitate correction. • Allow the students to strike out words and use arrows rather than make erasures. • Have another, more skilled classmate correct work.
Students have trouble transcribing their texts in a readable manner.	• Plan publication with the students and assist them throughout the process. • Provide different tools and resources for publication (e.g., computer technology, multimedia).

Spelling

Spelling correctly can be challenging for students with special needs for a variety of reasons. Some students' spelling difficulties will be related to the phonological difficulties associated with poor reading. Other students may have difficulties with visual memory for spelling patterns, and may find it difficult to identify whether or not a word is spelled correctly. The following teaching strategies can focus on explicit teaching of spelling rules, or compensatory strategies for spelling.

- Allow students to audio-record their writing and/or use other assistive technologies (e.g., word processor, voice-to-text software, word prediction software).
- Provide students with a scribe (e.g., peer, teacher's assistant, volunteer).
- Frequently check students' work, promptly redirect them when needed, and provide encouragement.
- Encourage students to use partial words and other external cues (e.g., word shapes) when using visual/mental imagery (e.g., students write the word within empty or partially filled boxes: _oa_ – boat).
- Students use auditory and kinesthetic activities to reinforce their visual representations of spellings.
- Students generate personal mnemonics for common but hard-to-spell words.
- Provide students with examples for each spelling rule or have students record their own examples of each rule.
- Students participate in phonological activities to reinforce the concept of letter–sound correspondence.
- Provide students with relevant sight word vocabulary (e.g., word banks, word walls) related to specific subjects and areas of interest.
- Have students develop personal sight word banks. Group words by vowel sound and spelling to allow for rule-governed approaches to spelling by analogy.
- Provide students with "rules" for spelling by analogy (e.g., "Look under known words that have the same vowel sound and spelling in your spelling dictionary.").
- Allow students to use assistive technologies to check their spelling attempts or to produce spellings for unknown words.

Handwriting

Students' handwriting can either facilitate or hinder their ability to communicate their ideas in print. For instance, students who are able to print readily are more able to focus their efforts on the content of their writing than are students who struggle with the formation of letters and words. In the latter instances, teachers have the difficult task of distinguishing between the students' ideas and concepts and their abilities to produce them in text (Saint-Laurent, 2002). Furthermore, when students' print is legible, teachers can more readily understand their ideas and the content of their writing.

The handwriting of students may have some of the following characteristics:

- inaccurately formed and sized letters
- too small, too large, or unequal letters

- too little or too much spacing between words and/or letters
- limited and slow print production

While it is the opinion of the Expert Panel that teachers should *not overemphasize the focus on print production*, and should encourage students to use assistive technologies whenever possible, we provide the following suggestions for assisting students who struggle with print formation and handwriting in general. The recommendations provided in this list are not exhaustive, but are intended to provide teachers with some initial ideas for programming.

Promoting the accurate formation of letters

- Check students' posture, wrist mobility, and fluidity of movements.
- Check students' pencil grip, arm and paper position, and pressure on pencil.
- Provide students with pencil grips to improve their grasp of the pencil.
- Provide students with sample letters and other reference documents (e.g., alphabet tape).
- Model how to form letters and print.
- Have students form letters using different materials (e.g., gel in a plastic bag, modelling clay) or trace letters using stencils, sandpaper, or tracing on a friend's back.
- Provide students with purposeful writing activities.
- Provide students with lined sheets or graph paper.

Promoting the accurate sizing of letters

- Provide students with visual guides or mnemonics for positioning letters (e.g., writing the letters of the alphabet within two lines of a "sidewalk"), and emphasize letters that extend above or below these markers (e.g., highlight letters that extend above or below the sidewalk).
- Provide students with sample letters of the desired size and other reference documents (e.g., alphabet tape).
- Provide students with corrective feedback that emphasizes the proper shape and size of letters.
- Provide students with lined sheets with adequate spacing between the lines.

Promoting appropriate spacing

- Use manipulatives (e.g., blocks, poker chips, unilinks) to represent individual words and their placement in print.
- Use graph paper to guide students' placement of print (e.g., have students leave one square for each space between words).
- Have students identify spaces between words in texts and other print materials (e.g., magazines, newspaper).
- Have students "clap out" or use other kinesthetic activities to reinforce units, and spacing within those units.
- Read to students what they write, so they become aware of the importance of leaving spaces to make it easier for the reader to understand a sentence.

Promoting students' production of written compositions

Some of these are the same as the recommended strategies for helping students with spelling:

- Allow students to audio-record their compositions and/or use other assistive technologies (e.g., word processor, word-prediction software, voice-to-text software).
- Provide students with a scribe – possibly a peer, teacher's assistant, or volunteer.
- De-emphasize the importance of writing mechanics (e.g., spelling, grammar, punctuation).
- Have students focus on only one element at a time when writing (e.g., gather thoughts related to main character).
- Provide corrective feedback for each concept or idea.
- Teach students keyboarding skills.

9 Organization and Management

Teachers can use specific organizational and instructional strategies to support the development of the literacy and numeracy skills of their students. As we have emphasized throughout this report, strategies consistent with the principles of universal design and differentiated instruction are helpful when considering the diverse learning needs of all students.

The teacher must make every effort to develop the full potential of every child, no matter the extent of his or her needs. However, the teacher cannot do this in isolation. He or she will need to develop partnerships among all the people who are participating in students' development (e.g., parents, special education/resource teacher, principal, psychologist, speech language pathologist, community services staff). In addition, teachers must not hesitate to consult with and use the support services available at the school board level.

Shared Responsibilities for Inclusive Education

Everyone must embrace the principle of inclusion for all children. Inclusion is the responsibility of all staff members: the school principal, teachers, and support staff. The principle of inclusion must be supported by students, parents, and postsecondary educational institutions such as colleges and universities.

The principal. The principal oversees and is ultimately responsible for the implementation of the Individual Education Plan (IEP). Principals facilitate collaborative planning, evaluation, and updating of special education programs and services. Success in setting up a professional learning community in a school depends a great deal on the leadership of the school's principal. (For details on these communities, see Chapter 5.) Ideally, the principal will be a "guiding leader", willing to share power; provide open, frank communication; ensure accountability of personnel; and recognize that everyone plays an important role in the school.

The classroom teacher. Teachers hold primary responsibility for all the students in the classroom. They contribute first-hand knowledge of students' strengths, needs, and interests; have the greatest effect on students' learning; and are responsible for creating the best possible learning environment. They organize, develop, and implement teaching strategies to allow students to achieve to the best of their abilities. Teachers proactively plan for student success using class and student profiles in an environment that embraces the concepts of universal design.

The special education teacher. Many children with special needs spend the majority of their school day in a regular classroom and a small portion of their day or week in a resource room where they work with a special education/resource teacher. In many situations, resource teachers work with these students to improve their reading, writing, or mathematical skills. It is important for the regular classroom teacher and the resource teacher to collaborate and coordinate their efforts. The partnership between the two teachers should lead to the sharing of expertise, more accurate observations, joint planning, more specific assistance for students, and groupings and strategies as appropriate.

Support staff. Other staff who may also provide services for children with special needs include, for example, the following:

- *Teacher's assistants,* some of whom are certified to work with students with special needs, can help the regular classroom teacher provide individualized instruction for some students.
- *Psychologists* can provide detailed assessment information (including diagnoses), participate in discussions with the in-school team, and make recommendations to teachers about ways in which students with special needs can learn more effectively.
- *Counsellors,* along with psychologists, can provide socio-emotional supports for students.
- *Social workers* often help to coordinate family and community services for students.
- *Qualified medical practitioners* conduct health assessments and prescribe/administer certain medications.
- *Occupational therapists and physical therapists* help students recover from remediable physical impairments.
- *Speech and hearing specialists* help improve some students' communication and listening skills.

Students with special education needs. Children need to be in an accepting, safe environment that enables them to take risks and ask for help, in order to acquire the skills, procedures, and strategic knowledge that will allow them to become independent learners.

Peers. Other students may need to be taught that students with special education needs have skills, and how to work in collaboration with students with special needs.

Parents. Educators and researchers increasingly recognize how important it is for teachers and parents to jointly guide the learning of children with special education needs (Williams & Cartledge, 1997). Educators need to establish open lines of communication so that everyone's experiences can be put to use. As the first educators of their children, parents can provide important information that will assist in the development and implementation of the child's educational program. Parents reinforce and extend the educational efforts of teachers and are a very important part of the school team. They need to feel that their child is part of the group and has been accepted on an equal footing with the others; that the teacher is cooperating with them; and that they have a role to play in their child's education. In addition, parent associations provide valuable information and resources related to students' needs and strengths.

Universities and community colleges. Schools and postsecondary institutions can form fruitful partnerships for producing and acting on knowledge about the special learning needs of Ontario students. Colleges and universities provide initial and ongoing education and training for teachers and support staff. They also conduct research that continues to promote successful practices. Postsecondary institutions should be an important resource for up-to-date information about what we know about teaching and learning for children with special education needs. Discussions with researchers in these institutions can lead to the development of research projects that answer questions of relevance to teachers, and further our understanding of effective practice.

Creating a Positive Learning Environment

Studies of teachers who implement proactive management methods have shown that these techniques lead to less student misbehaviour and more academically focused behaviour (Abbott et al., 1998; Durlak, 1995). Furthermore, behaviour problems are dramatically decreased when instruction and support anticipate and meet students' needs. Successful strategies that promote a sense of usefulness and belonging support both appropriate behaviour and academic achievement.

A person's sense of self greatly affects how that person functions in the world. It can have a profound impact on psychological development, interpersonal relationships, academic performance, and overall educational experience (Harter, 1990; Gurney, 1987). While boosting self-esteem alone is unlikely to cause academic improvement (see Baumeister, Campbell, Krueger, & Vohn, 2003), students who feel positive about their learning abilities are more likely to engage with learning tasks and persevere, which is more likely to lead to positive learning outcomes. This in turn may strengthen a student's self-esteem and sense of self-worth in relation to schooling (Skaalvik & Hagtvet, 1990).

Teachers can create a learning environment that is positive and fosters a sense of comfort and security in the classroom through a number of actions and approaches:

- **Positively reinforce students' success in daily tasks from an early age.** A student's early school experiences may have a significant impact on his or her willingness to engage and persist in later learning.
- **Take childrens' ages into consideration.** Self-concept develops on a continuum. Young children have a concrete, physical view of themselves, related mainly to concrete situations. Teachers can help them address these concrete situations effectively. As they grow older, children's self-concept becomes increasingly complex. They tend to become less positive, but more realistic, especially starting at age eight, when they begin to compare themselves with others (L'Écuyer, 1994; Stone & Lemanek, 1990).
- **Provide tasks associated with a moderate degree of success.** Success on moderately difficult or challenging tasks that is attributed to personal effort and ability gives rise to feelings of pride, competence, determination, satisfaction, persistence, and personal control.

- **Use ways to motivate learning.** Self-determined, freely chosen, personally controlled behaviour elicits high task interest, creativity, positive emotion, and persistence. External rewards can be used to initiate student work or reward completion, but should be gradually phased out as the student experiences success.
- **Supply immediate, specific feedback.** Immediate feedback, such as congratulations for the correct answer or response, increases student learning and a sense of competence.
- **Encourage moderate risk taking.** Teachers maximize student performance, persistence, perceived competence, self-knowledge, pride, and satisfaction by creating tasks that will make students willing to face the risk of failure in order to achieve the pleasure of success.
- **Provide an environment tolerant of error making and supportive of error corrections.** Students need to know that attempts to learn are highly valued versus an emphasis on right or wrong responses.
- **Communicate the belief that all students can learn, and wherever possible, reinforce this belief with frequent and specific encouragement or praise for appropriate behaviour** (Abbott et al., 1998; Durlak, 1995; Hawkins, 1997). To this end, watch for praiseworthy behaviours and provide immediate positive feedback. Be specific in exactly what you find worthy of praise. For example, "You were very patient while you waited your turn. I am proud of you."
- **Organize the physical setting to meet student needs.** Student groupings, for instance, can enhance social interactions or address physiological issues that may be affecting behaviour.
- **Clarify routines and expectations.** For example, let students know what is coming next by putting a schedule up on the wall.
- **Make more positive than negative statements.** Positive reinforcements should outweigh negative reinforcements by a ratio of four to one (Gottfredson,1997; Lipsky, 1996). Rules should be stated in terms of what students will do, rather than what not to do, such as:
  - "use your inside voice";
  - "do your best";
  - "use polite words".
- **Actively involve all students in learning tasks** (Perrenoud, 1997). Provide students with high expectations along with support that allows them to reasonably meet those expectations.

Organizing and Managing Instructional Variables

The teacher can plan for a number of instructional variables that have an impact on the development of literacy and numeracy skills:

- universal design and differentiated instruction (see Chapter 2 of this report for further information)
- classroom and individual student profiles (see Chapter 4 of this report for further information)
- appropriate accommodations and/or modifications
- time management
- use of human resources

Accommodations and/or Modifications

To manage a classroom with diverse learners, the teacher must understand the difference between the terms *modification* and *accommodation*. In some cases, accommodations may be sufficient to meet the student's learning needs; in other cases, modifications are required; and sometimes a student may require both.

The teacher should clearly identify in the student's Individual Education Plan (IEP) the accommodations that the student requires in connection with instruction, assessment, and functioning in the physical environment, as follows:

- *Instructional accommodations* – adjustments in teaching strategies required to enable the student to learn and to progress through the curriculum
- *Environmental accommodations* – changes or supports in the physical environment of the classroom and/or the school
- *Assessment accommodations* – adjustments in assessment activities and methods required to enable the student to demonstrate learning

Accommodations

Accommodations refer to the special teaching and assessment strategies, human supports, and/or individualized equipment required to enable a student to learn and to demonstrate learning. Accommodations do not alter the provincial curriculum expectations for the grade.

(Ontario Ministry of Education, 2004b, p. 25)

Modifications

Modifications are changes made in the age-appropriate grade-level expectations for a subject in order to meet a student's learning needs. These changes may involve developing expectations that reflect knowledge and skills required in the curriculum for a different grade level and/or increasing or decreasing the number and/or complexity of the regular grade-level curriculum expectations.

(Ontario Ministry of Education, 2004b, pp. 25–26)

Putting accommodation or modification into action

When considering the individual learning profiles of particular students and whether those students require accommodations or modifications, it is essential that the teacher be mindful of the purpose of particular lessons.

For example, if the purpose of a lesson is the development of reading skills, the student should work with materials that are consistent with his or her instructional level. The student may have modified learning expectations that are drawn from a lower grade level. *In this case, the lesson would be modified.*

However, if the purpose of the lesson is to appreciate and respond to a particular story, poem, or other piece of literature, the materials might be consistent with the student's listening comprehension or grade placement levels. In this case, the teacher may have to ensure only that the student can easily access the text. The student might need supports, or "accommodations", in the form of a taped text, a reading buddy, assistive technology, or the voice of the teacher. *In this case, the lesson would be accommodated.*

Table 12. Types of Accommodations

Instructional	Environmental	Assessment
• Buddy/peer tutoring	• Alternative work space	• Extended time limits
• Note-taking assistance	• Strategic seating	• Verbatim scribing
• Duplicated notes	• Proximity to instructor	• Oral responses, including audiotapes
• Learning contracts	• Reduction of audio/visual stimuli	• Alternative settings
• Reinforcement incentives	• Study carrel	• More frequent breaks
• Highly structured activities	• Minimizing of background noise	• Assistive devices or adaptive equipment
• Partnering	• Quiet setting	• Prompts to return student's attention to task
• Augmentative and alternative communications systems	• Use of headphones	• Augmentative and alternative communications systems
• Assistive technology, such as text-to-speech software or graphic organizers	• Special lighting	• Assistive technology, such as speech-to-text software
• Non-verbal signals	• Assistive devices or adaptive equipment	• Large-size font
• Organization coaching		• Colour cues
• Time-management aids		• Reduced/uncluttered format
• Mind maps		• Computer options
• More frequent breaks		• Extra time for processing
• Concrete/hands-on materials		• Reduction in the number of tasks used to assess a concept or skill
• Manipulatives		
• Tactile tracing strategies		
• Gesture cues		
• Dramatizing information		
• Visual cues		
• Large-size font		
• Tracking sheets		
• Colour cues		
• Reduced/uncluttered format		
• Computer options		
• Spatially cued formats		
• Repetition of information		
• Rewording/rephrasing information		
• Extra time for processing		
• Word-retrieval prompts		
• Taped texts		

(Adapted from Ontario Ministry of Education, 2004b, p. 29)

Developing modified expectations

When teachers are developing modified expectations, they need to make important decisions regarding the skills and knowledge to be taught. Some skills are more essential than others. For instance, to have a student with weak memory skills focus extensively on memorizing mathematical facts may not be the best use of instructional time. With the use of a calculator, the student could focus on developing important conceptual skills that enhance mathematical understanding. The following three questions could help a teacher develop modified learning expectations (Heacox, 2002):

1. What are the most important concepts?
2. What is essential for this student to know and understand?
3. What concepts or ideas do we continue to refer to as we move through this curriculum?

Table 13 provides examples of how a teacher could plan lessons that incorporate individual students' modified or alternative expectations.

Table 13. **Modified Programming for Students With Special Needs**

Modified or alternative programming	**What it means**	**Example**
Same activity, *modified* learning expectations, *same* materials	The activity (subtraction) and the materials (counters, pencil/paper) remain the same, but the learning expectations for the student are different.	When working on subtraction with regrouping, certain students may still need to work on subtraction without regrouping.
Same activity, *modified* learning expectations, *different* materials	The activity the student is engaged in (responding to a teacher-read story) remains the same as that for his or her peers, but the learning expectations and materials are changed to enable the student to remain an equal participant in the activity.	The teacher reads a story to the class. The teacher assigns some students inference questions, and gives others pictures depicting the story, to be placed in logical sequential order.
Different activity, *modified/alternative** learning expectations, *different* materials *Alternative expectations are developed to help students acquire knowledge and skills that are not represented in the Ontario curriculum (Ontario Ministry of Education, 2004b)	Students participate in different activities (classifying, identifying, grasping). Some students have modified expectations. One student works on an alternative expectation.	For the October "Harvest Time" theme for the primary class, the students are classifying fruits and vegetables. Some students are identifying the names of different fruits (modification). One student is developing the skill to grasp and lift a piece of fruit (alternative expectation).

Selecting instructional groupings

Flexible and dynamic grouping practices are effective means of teaching to students' known strengths and needs. Groups are *flexible* when they are formed around particular instructional elements (e.g., teaching place value in mathematics or word families in literacy) and they are *dynamic* when group membership changes.

Whole-class or large-group instruction. When teachers use whole-class or large-group instruction, they usually need to provide accommodations to ensure that all students are learning. For instance, a poor reader may need a peer tutor to preteach new vocabulary to the student.

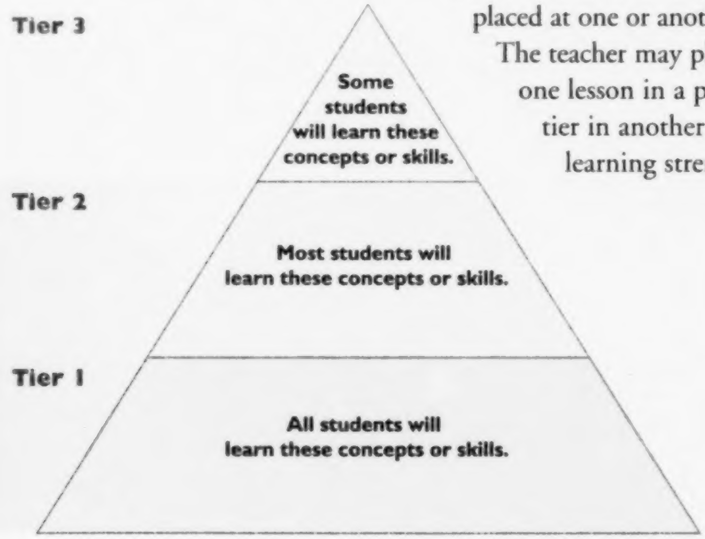
Small-group instruction – same-skill grouping. Small homogenous groups work on a similar skill at a similar level, allowing the teacher to proceed in small steps and the students to master skills with many examples. Small same-skill groups should be flexible and short-term, and used only when attempts to adapt instruction in the large group have been unsuccessful, because students can feel stigmatized if they are constantly assigned into low-functioning groups (Friend, Bursuck, & Hutchinson, 1998).

Small-group instruction – mixed-skill grouping. The research points to positive effects on achievement, self-esteem, intergroup relations, and greater acceptance of mainstreamed students (Slavin, 1991) in heterogeneous groups. Students can help each other and provide a range of role models and peer tutoring. These groups should be flexible.

Modifying curriculum – tiered activities

Teachers use tiered activities so that all students focus on essential understandings and skills but at different levels of complexity, abstractness, and open-endedness. By keeping the focus of the activity the same, but providing routes of access at varying degrees of difficulty, the teacher maximizes the likelihood that each student comes away with pivotal skills and understandings, and that each student is appropriately challenged (Tomlinson, 1999).

Figure 8. Planning Pyramid


Tier 3
Some students will learn these concepts or skills.
Tier 2
Most students will learn these concepts or skills.
Tier 1
All students will learn these concepts or skills.

Teachers can use a "planning pyramid" to help them develop tiered activities, in which all students' outcomes can be placed at one or another of the tiers for a specific lesson. The teacher may place a student in the lowest tier in one lesson in a particular unit, and in the second tier in another lesson, depending on the student's learning strengths and needs.

A sample tiered activity for vocabulary development

Put the assignment into three colour-coded file folders:

- red for tier 1 students
- blue for tier 2 students
- yellow for tier 3 students

Tier 1 students would get pictures that illustrate specific vocabulary related to the current unit of study that they are ready to learn. They would be expected to match the pictures to the words on the vocabulary list.

Tier 2 students would find pictures from magazines that illustrate specific words on the vocabulary list related to the unit of study that they are ready to learn. They would also generate as many additional words as possible related to the unit of study, find pictures to illustrate those words, and create a poster.

Tier 3 students would create a poem using as many of the words on the vocabulary list and additional words as possible, and illustrate it themselves or find pictures from magazines.

Additional strategies for modifying curriculum

Subdividing the class – an essential component of differentiated instruction – enables the teacher to think about variation in student need and to create groups that attend to student learning differences at both ends of the ability spectrum. Table 14 (adapted from Tomlinson, 1999) illustrates some of these strategies.

Table 14. Strategies for Modifying Curriculum

Strategy	Description	Guidelines for Use
Curriculum Compacting	This is a good strategy for gifted students. Students bypass previously mastered skills and content, enabling them to move through the curriculum at a level appropriate to their ability. The instructional focus is only on mastery of areas where students have not acquired the necessary skills. Students can "buy" time to work on independent projects that match their interests and abilities.	Curriculum compacting involves the following steps: 1. Select the learning expectations for a given subject. 2. Find or create an appropriate way to pretest or alternatively assess competencies related to these expectations. 3. Identify students who may have mastered the expectations, or pretest all students in the classroom. 4. Pretest students, before beginning instruction, on one or more of the expectations. 5. Reduce practice, drill, or instructional time for students who have learned the expectations. 6. Allow choice in use of "bought" time.

(continued)

Table 14. Strategies for Modifying Curriculum (continued)

Strategy	Description	Guidelines for Use
Flexible Grouping	Grouping is based on student skill proficiency, content mastery, readiness, interest, and learning profile. Students change groups frequently as they are grouped and regrouped.	• Begin with activities that promote cooperative, collaborative, and independent work skills. • Establish clear guidelines for group functioning that are taught well in advance. • Vary groupings. Use groupings based on: – size: whole class to partners; – ability: homogeneous or heterogeneous – other factors: student choice, topic interest, gender, age.
Learning Contracts	Learning contracts are agreements between a teacher (or teaching team) and a learner (or occasionally a group of learners) to plan activities or a piece of work to meet the requirements of a course or module. Learning contracts are based on the principle of the learners being active partners in the teaching–learning system, rather than passive recipients of whatever it is that the teacher thinks is good for them. They recognize learners' ownership of the process.	• Clearly set out criteria, expectations, and deadlines. • The student makes choices about activities related to expectations and outcomes. • The activity or performance task could be a project, a portfolio, a videotape of practice, or an object. • The teacher and the student write and sign a contract or plan that includes a written list of resources that will be accessed. • The contract is proactive in allowing the student to take the initiative in proposing work to meet requirements.
Mentorship/ Apprenticeships	Mentors are knowledgeable about a specific area of study and act as guides, teachers, and advisors. They provide students with opportunities to pursue a topic of interest in greater depth.	• Match mentors with mentees based on students' needs, interests, strengths, and so on. • Clearly outline the goals of the collaboration. • Carefully select and prepare mentors. • Clearly state roles. Write goals and share them. • Monitor progress of the mentee–mentor relationship. • Provide in-class time for the mentors and mentees to work together.
Independent Studies	The student and teacher identify a topic of interest and plan a method for the student to investigate the topic and demonstrate the acquisition of new skills and knowledge. Independent study allows the student to learn at his or her own pace and ability. Performance tasks may focus on application of skills to content knowledge.	• Set clear guidelines. • Provide resources. • Check in with student progress regularly. • Students may require guidance and structure. • Build on student interest. • Allow choices and freedom to plan based on the student's ability to work independently. • Discuss timelines. • Establish criteria. Communicate high expectations based on student strengths and abilities. • Have students use reflective journals to track the process and their progress.

Time Management

Developing modified expectations and planning for the provision of accommodations both take time. For teachers to differentiate instruction, they need to manage their own and their students' time effectively. The strategies listed below should be established early in the school year.

- Structure the day to establish consistent routines that allow for time to work with students individually or in small groups.
- Teach a limited number of classroom rules that are clear, fair, and understood by all.
- Plan time during the day for conferences, including individual student conferences.
- Sample student work and provide feedback.
- "Walk" the classroom. The teacher needs to be close to students, actively observing or engaging with them as they are learning. Important observational assessment data can be gathered on the spot, readily reinforce learning, and provide immediate feedback.
- Know that all students need attention but not all students need the same amount of time. (Strickland, Ganske, & Monroe, 2002).

Using an anchor activity as a time management strategy

Teaching all of your students to do an "anchor activity" is an effective time management strategy as well as a good way to begin to provide differentiated instruction. An anchor activity is an assignment that provides meaningful work for students when they finish another assignment or project, when they first enter the class, or when they are stuck and can't move on without adult assistance. It provides ongoing tasks that tie into the content and instruction, and/or free up the teacher to work with other groups of students or individuals. Students may work on anchor activities throughout a unit or a grading period, or longer.

Suggestions for anchor activities

- Working at a learning or interest centre or a listening station
- Brain challenges
- Individual learning packages
- Vocabulary work
- Investigations
- Magazine articles with generic questions or activities
- Research questions or projects
- Journals or learning logs
- Content-related silent reading

Anchor activities can be used in any subject, and are effective when they are:

- assigned to the whole class;
- assigned to a small group;
- assigned to an individual;
- tiered to meet the needs of different readiness and ability levels;
- interdisciplinary for use across the curriculum.

Teachers should plan for anchor activities and monitor their ongoing effectiveness. Table 15 provides factors to consider when implementing anchor activities.

Table 15. Planning for Anchor Activities

Subject / Content Area:

Name and Description of anchor activity:

How will the activity be introduced to the students?

How will the activity be managed and monitored?

☐ Points

☐ Rubric

☐ Checklist

☐ Random check

☐ On-task behaviours

☐ Portfolio check

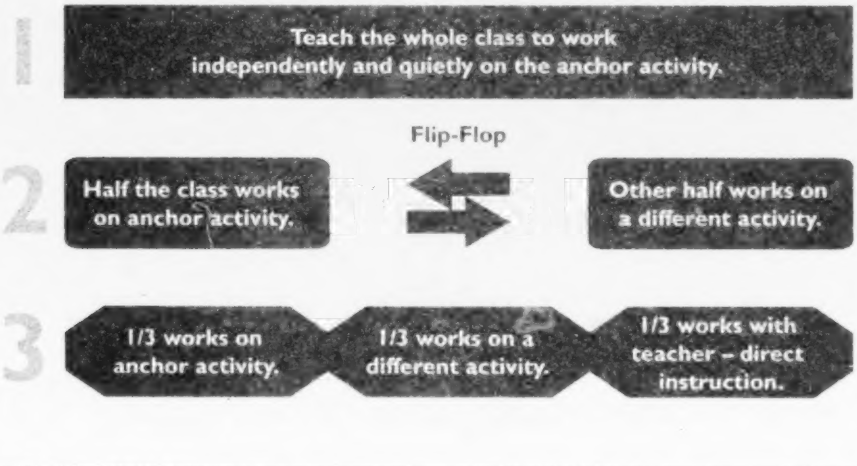
☐ Teacher–student conference

☐ Peer Review

☐ Other:

Anchor activities work best when expectations are clear and the tasks are taught and practised prior to use, and when students are held accountable for on-task behaviour and/or task completion. Students must be explicitly taught how to work on anchor activities, since such activities may demand a high degree of independence. Figure 9 represents the steps towards training students to use anchor activities independently. Teachers need to teach students how to use anchor activities over time. Each step would be practised over a period of several weeks and mastered before moving on to the next step.

Figure 9. Using Anchor Activities to Create Groups


1
Teach the whole class to work independently and quietly on the anchor activity.
Flip-Flop
2
Half the class works on anchor activity.
Other half works on a different activity.
3
1/3 works on anchor activity.
1/3 works on a different activity.
1/3 works with teacher – direct instruction.

Managing Transitions

Research shows that teachers can increase instructional time by managing transitions carefully (Friend et al., 1998; Ornstein, 1990). Teachers can provide "signals" to help with transitions for students who have difficulty managing transitions from one literacy or numeracy activity to another, as follows:

- Use visual and verbal cues, such as a posted visual schedule or picture cues.
- Bring closure to the end of an activity – e.g., teach students to respond to a song or do a kinesthetic activity.
- Declare the beginning of the lesson with a signal or cue.
- Provide and reinforce clear and consistent expectations about behaviour during transitions.
- Use social stories or picture cues.

Use of Human Resources

Working with occasional teachers and other professionals

Some students may become anxious or disoriented with sudden changes, which may include the presence of unfamiliar or additional teaching or support staff. To help these students, it is necessary to provide occasional teachers or other professionals in the classroom with information about specific student needs and the strategies used to help them. Student stress can be minimized when such information is included in occasional-teacher emergency protocol booklets. Such materials may include information such as that shown below.

Name of the student	Comments
Devon	Devon has difficulty with reading instructions. He has a peer buddy, Jorges, to help him with his reading.
Miriam	Miriam needs to report to the office at 12:00 to obtain her medication for the day. She benefits from frequent breaks and is allowed to take messages to the office when she has difficulty paying attention.
Saeeda	Saeeda requires the use of an FM system. The microphone is located on the daybook. Ensure that it is turned on (button on left) during class but be sure it is turned off when instruction is over.

Working with teacher's assistants, caregivers, interpreters, and other support staff

The teacher is responsible for the education program of all students, including those who benefit from support provided by teacher's assistants, caregivers, interpreters, and other support staff. The following are essential components for a productive working relationship between teachers and support staff:

- respect and consideration
- recognition of roles: for example, that teacher's assistants are not teachers and should not be requested or required to develop or evaluate an education program
- open lines of communication
- clear protocols for communicating with parents

In addition, teachers should note the following guidelines for working with a teacher's assistant:

- Share information regarding learning goals and the contents of the Individual Education Plan (IEP).
- Find out the assistant's skills and strengths, and make good use of them in the classroom.
- Be willing to make or take suggestions and to give examples.
- Plan in advance for the assistant (e.g., include a column in the daybook for the assistant or use another written record).
- Have the assistant work with other students while the teacher spends a few minutes in direct instruction with the student with special needs.
- Establish regular routines and duties for the assistant.
- Encourage initiative on the part of the assistant.
- Correct tactfully and criticize constructively.
- Encourage the assistant's professional development.

10

Computer-based Assistive Technology

A chapter on computer-based assistive technology is necessary to this report because access to computer technology in today's classroom can provide teachers with such a wide range of tools to make inclusion possible and easier. Many "built-in" assistive technology features turn out to be advantageous for a broad range of individuals, not just those with special needs. Indeed, if teachers can build supports and scaffolds necessary to ensure progress for all learners – such as assistive technology – into their instructional methods and learning materials from the very beginning, all learners will benefit from less need for remediation and fuller participation in the regular curriculum (Hitchcock, 2001).

Assistive technology plays an important role in the provision of instruction based on universal design. In a universally designed classroom, teachers can provide students with the tools necessary to adapt methods and materials to their individual needs, flexible goals for learning, and continuous assessment (Hitchcock, 2001). Teachers can support all students with equitable access to all aspects of the learning experience – equal access to the curriculum where this would otherwise be not possible or very difficult, and equal access to the tools needed to access the curriculum. The positive impacts of assistive technology on the development of even very young children are demonstrable (Judge, 2001).

What assistive technology is – and is not

Assistive technology is any technology that allows one to increase, maintain, or improve the functional capabilities of an individual with special learning needs (Edyburn, 2000). Its applications and adaptations can help open doors to previously inaccessible learning opportunities for many children with special needs (Judge, 2001).

Assistive technology differs substantially from other types of technology that assist students. Instructional technology, for instance, uses innovative tools such as videotapes, computer-assisted instruction, projectors, multimedia effects, sound enhancement, and the Internet to expand the instructional modalities in the classroom, without regard to specific students' needs.

Assistive technology also differs from assistance such as wheelchairs, hearing aids, and glasses for vision, which are, of course, essential to the students who require them.

Some assistive technology changes the environment so that a person can function (adaptive technology); some technology adds qualities to the environment (augmentative technology).

Tools to Help All Students Learn More Effectively

Tools that can help all students

- Word processing
- Spell and grammar check
- Thesaurus
- Graphic organizers
- Spreadsheets and databases
- Publishing software such as graphics and multimedia tools
- Presentation software
- Tools for organizing information
- Webquests

Computer programs are designed to perform one or more particular tasks or functions. To this end, each computer program contains a variety of features. Assistive technology computer programs are fitted with particular features designed to assist specific functions – for example, a feature that will help with word finding. As a result, providing students with assistive technology software is akin to providing them with a "toolkit" for assistance specific to their needs.[9]

Thus, tools provided with a software program can have greater and wider impacts on learning than the complete software program. When evaluating any computer software program, therefore, it is more important for the teacher to ask "what tools will the student(s) need in order to be able to function (e.g., write more effectively)" than to request a particular program, which may lack the level and combination of features (tools) that will allow or encourage the student(s) to function with any degree of independence.

In a general education setting, computer-based assistive technology can provide students with:

- access to information;
- computer-assisted instruction;
- drill and practice;
- training;
- organizational strategies;
- the ability to publish;
- functional skills, such as keyboarding and computer skills;
- study strategies;
- unique experiences, such as multimedia.

In addition, using computer-based technology is desirable for the following reasons:

- Drill and practice tasks can be less monotonous on a computer than with pencil and paper.
- Using the computer in school is a part of school activities. It can be integrated with other school activities, rather than requiring withdrawal from the classroom.
- Students often see computers as non-threatening. Being corrected by a computer can be far less threatening than being corrected by another person.
- Computer use can assist in the development of a functional skill, and can also provide structure and give immediate feedback.

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[9] The Ontario Software Acquisition Program and Committee (OSAPAC), at www.osapac.org, provides a list of licensed software available from the Ministry of Education. Every school board has a representative that can assist teachers in accessing the software.

How Assistive Technology Can Benefit Students

Technology, of course, is not the answer to all the problems faced by students with special needs. It is necessary for some students in the same way that eyeglasses or other aids are necessary for some students. Its successful use in the classroom will depend on the characteristics of individual students; the outcomes that students need to accomplish; the task that meets the needs of a particular student; and the functional use of the hardware and software.

Nonetheless, the literature provides plentiful evidence that assistive technology can effectively help students with special needs to:

- build on individual strengths (Lewis, 1998; Martin, 1998);
- benefit from using a compensatory tool (Lewis; Martin);
- gain motivation (Martin);
- accomplish higher rates of learning and improved achievement (Martin);
- complete academic tasks independently, including tasks they might not otherwise be able to handle unaided, leading to a greater sense of self-efficacy (Polloway, Smith, & Patton, 1988).

Specific Benefits for Literacy and Numeracy

Assistive technology can specifically address reading, writing, and numeracy challenges (Edyburn, 2000, 2003). Among its capabilities are the following:

- *Word processing* can address fine motor difficulties and reduce messy work.
- *Spell-checking tools* can reduce some spelling difficulties.
- *The ability to place graphs and charts in assignments* can allow students to produce a better quality of assignment, reinforcing the value of published writing.
- *Cut-and-paste* features in word processors allow students to manipulate text easily when editing, saving valuable time and effort. The physical process and effort of rewriting work can be laborious, time consuming, and fatiguing for some students.

Limitations of Assistive Technology

Computer-based assistive technology is not a panacea. Students receiving special education programs and services usually have a number of areas of need. It is unrealistic to expect one or even several software programs to address all of a student's learning needs.

Complex solutions are not always the best solutions. The more tools that are embedded in a program, the more complexities the student, and the teacher, has to learn, unlearn, and set up. More often than not, the student needs only one assistive tool. The keep-it-simple "toolkit" approach (e.g., Puckett, 2004) will serve teachers best. The simpler, cheaper program may be the more appropriate than the spectacular "does-it-all" program. (For more details on assessing assistive technology, see Raskind & Bryant, in press.)

No one solution will address all learning and productivity issues. Even if a particularly persuasive vendor approaches an educator repeatedly with claims of the "perfect solution", that solution may not have the tools the teacher requires to support the specific learning challenges.

Not all assistive technology tools are appropriate for all students with learning challenges. One would not prescribe eyeglasses for a child who requires a support for hearing. Similarly, for every student, it is important to identify curriculum tasks and outcomes, evaluate barriers to accomplishing those tasks, and match the characteristics of computer technology with the student's individual learning profile.

Students need basic keyboarding skills to maximize the effectiveness of assistive technology. Basic keyboarding skills will affect any student's accomplishment with computer-based technology – even for those using speech recognition systems (see Edyburn, 2003; Higgins & Raskind, 2000).

Assistive technology does not replace the teaching and learning processes. It is a tool that is used to *support* teaching and learning.

Assistive Technology Tools to Support Students With Special Needs in Reading

A wide range of software tools supports reading across different learning abilities and styles. Three specific types of effective technological supports are Optical Character Recognition (OCR) for scanning text, speech synthesis of text, and the thesaurus found in most word-processing programs. This section provides details on OCR and speech-synthesis software.

Optical Character Recognition (OCR). OCR software allows students to scan reading material into a computer and then see only the text from the scanned material on the computer screen. It essentially separates the text from any pictures in the text and converts text information into a text format. It requires a scanner (handheld scanners can only scan limited lines of text), word-processing software, and specialized OCR software. It is important to note that some OCR software is better than others. In general, OCR software should maintain formatting, such as page layout and graphics that may be important for working with the text. It should also handle columns effectively and interpret print reliably.

Speech synthesis (screen readers, or read-back software). Speech synthesizers are basically screen readers. They read text that is displayed on the computer monitor, allowing students to gain independent access to assignments, books, and research. Teachers or students do, however, need to pre-scan material before they can use it.

For some students, OCR software combined with a screen reader provides their first opportunity to enjoy literature. In addition to a scanner and word-processing software, students require headsets so they can listen to reading passages without disturbing others.

These two technologies combined can be particularly helpful for students who have relatively few problems comprehending spoken language but have great difficulty with decoding of text. The research demonstrates that OCR and speech synthesis reduce frustration in decoding and allow for more complete comprehension of text (Lundberg, 1995; Montali & Lewandowski, 1996).

In addition, several researchers have noted that the use of this technology can actually improve word-recognition and decoding skills (e.g., Higgins & Raskind, 2000; Olson & Wise, 1992; Torgesen & Barker, 1995). One longitudinal study in particular (Lundberg) demonstrated improved word recognition and spelling in students with lower scores in these areas as compared with a control group not supported by computer use.

For students who can handle the content of any given subject or course, the use of OCR and speech synthesis allows them to access the print in textbooks, and thereby the curriculum, in a way that would otherwise be more difficult, if not impossible. It may even increase student motivation to read (Montali & Lewandowski, 1996).

How students can use speech-synthesis software

- Where text is available in digital form (i.e., on the computer or diskette), students can have text read to them.
- Some screen readers can read in a variety of applications, including the Internet.
- Some Internet sites have collections of textbooks available to be read by screen readers.
- Students can control the pace of the reading and the reading selection, through having the computer read only the words they are having difficulty decoding or a whole paragraph or passage.
- Students can manipulate the rate of read-back to allow for variations in the speed they process auditory information.

Assistive Technology Tools to Support Students With Special Needs in Writing

Likewise, a wide range of software tools supports writing across different learning abilities and styles. These include the thesaurus and publishing tools such as graphics and multimedia capabilities, now widely available in word-processing programs. This section provides a detailed look at more specialized software that enables:

- word prediction;
- planning and organizing;
- specialized (aural, or dyslexic-style) spell check;
- speech synthesis (text to speech);
- speech recognition (spoken word to text).

Word-prediction software

Word-prediction software can be installed on computers that run word-processing software. It has been found to be the most effective tool for assisting written expression (Laine, 1999; MacArthur, 1998).

Programs that contain this feature display a window that lists high-frequency words as the student types. Once the student types the first letter, the highest-frequency words beginning with that letter are displayed. Most often, four to nine words appear. Then, when the student enters the second letter, the screen lists high-frequency words starting with the first two letters. As the student continues to type, most word-prediction lists continue to narrow the number of possible selections based on the additional letters. The student can select the word he or she is trying to spell once he or she sees it, and it will appear in the student's text. The words the writer uses are saved as he or she uses the tool. That way, the student builds a personalized word list over time.

Among the many variations of word-prediction software available on the market, there are:

- programs that read the word choices displayed, thus providing both visual and aural assistance;
- programs that try to predict what the student might write next, based on syntax and spelling;
- programs that are marketed as "word-prediction" programs but are only "word-completion". Some programs try to predict the next word in the sentence based on the previous word. For example, if the student types "The c_", the program responds with "c" nouns. Word-completion programs respond by providing *all* common "c" words;
- programs that are integrated with a word-processing program. Students who use these programs may have to learn a word-processing program that differs from the word-processing program with which they are familiar.

Word prediction does not give the user "the answer" to any question. This tool essentially provides students with an immediately available vocabulary list, speeding up the writing process by allowing writers to find the most appropriate word (see Wiig & Semmel, 1980).

Word-prediction technology also can reduce spelling mistakes, increase motivation, and help students who have difficulty with the physical act of writing.

MacArthur (1996) found that word prediction can make a significant positive impact on the writing of students with severe spelling difficulties. Word prediction offers an independent method for word finding and self-monitoring for these students, because they only need to know the first letter of a word in order to use it in their work. Other case studies show that word prediction can increase the quantity and quality of work in addition to improving spelling (e.g., MacArthur, Ferretti, Okolo, & Cavalier, 2001).

To make the most of this tool, MacArthur's studies suggest that:

- teachers need to pay careful attention to students' skill, the design of the word-prediction tool, and the match between this technology and the task;
- teachers should be aware that students whose oral skills are extensive or esoteric do not find word prediction as useful as students whose vocabulary is more limited;
- teachers need to encourage students to extend their vocabulary and not rely repeatedly on the same words;
- students need to be able to remember what they intend to write while selecting words;
- younger students should use word-prediction programs with a smaller vocabulary;
- teachers should consider selecting a word-prediction program that allows students to program specific vocabulary for the task.

Software for planning and organizing

Students with special needs often have difficulty organizing themselves in writing – a skill essential for high-quality written work, especially from junior years to secondary school (Graham, 1999). Software programs that help students organize and thereby structure their writing are usually visual in nature, allowing students to:

- create thought webs or cognitive maps that emphasize relationships between ideas;
- manipulate categories of ideas and place them where they think appropriate;
- see an outline of the topics and subtopics of their writing. Students can easily manipulate and reorganize the text at any time, allowing them freedom to express their ideas without worrying about categories;
- use one of the numerous templates already prepared and organized so that all they have to do is fill in the information in the appropriate area. Teachers who want students to follow a particular method or structure in an assignment can create a template for students to follow.

Most speech-recognition programs work within this software. As with all software, teachers need to understand it and its effective use. They need to provide explicit instruction on how to use the software (Anderson-Inman, Knox-Quinn, & Horney, 1996) and monitor the ways students use it. Otherwise, students may, for instance, spend more time playing with the graphic features of the program than on organizing and writing (Bahr, Nelson, & Van Meter, 1996).

Specialized (aural or dyslexic-style) spell-check software

Some students experience a great deal of difficulty with spelling. A good body of research (see Sitko, Laine, & Sitko, 2005) shows that traditional spell checkers available in virtually all word-processing programs are a useful tool for both good and poor spellers. They allow students to see some mistakes, and to choose the correct spelling from a number of options. But they only catch mistakes if the misspelling is somewhat close to the correct spelling. Also, they fail to red-flag homonyms or other "real" words that are misspelled in context.

Dyslexic-style spell checkers, on the other hand, check for reversed letters (*b* and *d*, *a* and *c*, *p* and *q*), missing first letters, and dyslexic-style phonetic errors, such as an *f* for *ph*. They display and can read aloud the spelling options. Some allow students to listen to the options available, speak meanings on homophones, and can allow students to program in unusual spellings that most spell checkers would not pick up. There has, however, been no research on whether these are more useful than traditional spell checkers.

Speech-synthesis (text-to-speech, or read-back) software

This tool, which converts text on the screen into aural speech, is as useful for effective writing for individuals with cognitive and communicative impairments as it is for assisting with reading. Hearing the text that one has produced can encourage increasing independence in self-monitoring one's writing (MacArthur et al., 2001). Speech synthesis has also been instrumental in improving spelling in some students with special learning needs (Sitko et al., 2005).

Speech-recognition (spoken-word-to-text) software

Speech-recognition software is a fairly affordable tool, and works with most word-processing systems. It allows students to dictate, into a microphone headset, what they want the computer to type. The student trains the computer to recognize his or her voice patterns and pronunciations by reading it material provided by the software for 30 minutes to several hours. The more a student uses the program, the better it gets at recognizing that student's voice – eventually reaching better than 90 per cent accuracy.

Designed for users with good communicative or cognitive abilities, or good visual vocabulary skills, speech-recognition software has found many disciples in the field of special education over the past five or so years. It can be particularly helpful to individuals whose oral language skills exceed their written production. Although speech recognition is most useful for students who are verbally fluent, with daily, supervised use it can also have a positive influence on the performance of less verbally fluent students (Wetzel, 1996).

While its many potential benefits can be good for some students, careful assessment of a student's abilities is essential before acquiring and implementing this technology. Current researchers have not come to a consensus about the effectiveness of using speech-recognition systems as a tool for students with special needs (Lords, 2001), and most research work on the use of this technology has been conducted with older students and adults.

Among its potential advantages are the following:

- It allows students to get their ideas down where this would otherwise not be possible.
- It allows students to write more fluently, and can improve spelling, reading comprehension, and word-recognition scores (Higgins & Raskind, 2000).
- For some students, it can be significantly faster than writing or typing (De La Paz, 1999).
- It allows students to use longer and more complex compositions with fewer grammatical errors as compared with other methods of written production.
- It demonstrates commensurate improvement in achievement for some students (Graham, 1999). Graham found that not only did students attempt to write down vocabulary they had avoided because they had previously been unable to spell it, they were able to work at a faster pace and therefore get down words they might have forgotten due to slower typing or writing speed.
- It allows students to see and review their dictation and use what is on the screen as a cue for remembering their thoughts (Wetzel, 1996).
- Once the laborious nature of writing is eliminated, students are more motivated to write (Graham, 1999).

Some of the improvement in the quality of the student's writing, it has been hypothesized, is a result of the student's need to attend carefully to what is being written on the screen. If the program makes an error, students are presented with, and must read and select among, several choices, and then use a command to correct the mistake (Forgrave, 2002).

There are, however, compelling reasons for teachers to exercise caution when considering the use of speech-recognition software.

It can be extremely time-consuming – for both students and teachers. All major researchers of this technology have shown that the attention of an aide (either a teacher or other support staff) increases the benefits gained. Initial training may require the student to read into the computer for laboriously long periods of time. An instructor will need to work with students who are not able to read the passages fluently. The instructor has to read one phrase at a time to the student, and have the student repeat that phrase back into the microphone, carefully ensuring that the instructor's voice is not picked up by the microphone. Furthermore, students with a reading disability may not be able to tell when they have made a mistake. In order to get the program working well with such individuals, an instructor must work with students one-on-one in the initial stages of using the program before allowing them to be independent.

Even after successful initial training, the program will make some mistakes. In order to use the program independently, students must learn and use the appropriate commands to inform the program every time it makes a mistake. Should students continue to ignore mistakes, the accuracy of the program *will decrease.*

Students must be aware of idiosyncrasies when dictating to the computer. The student must learn to "pause" the program when he or she wishes to talk or ask a question aloud.

Visual fatigue can set in. This lowers the effectiveness of the program when students use this tool for extensive periods of time (Wetzel, 1996). Alternating between voice and keyboard can be an important strategy for some students.

The technology may be too complicated for use by many students in a typical classroom setting. Each student has a personalized "voice file". He or she is responsible for opening this file when entering the program and saving this file when exiting it. In the "multiple-user" situation of the average classroom, there is a danger that a student may inadvertently use another student's voice file, thereby corrupting the file.

Assistive Technology Tools to Support Students With Numeracy Challenges

There are numerous non-technology programs and tools that assist students in mathematics, such as manipulatives or concrete tools. Students with numeracy challenges can also benefit greatly from assistive technology.

There are, for instance, a wide range of calculators with capabilities well beyond those of the traditional pocket or graphing calculator. Students can use:

- talking calculators that vocalize data and resulting calculations through speech synthesis;
- special-feature calculators that enable the user to select options to speak and simultaneously display numbers, functions, entire equations, and results;
- specialized hand-held calculators that can help a learner who has problems writing numbers in the correct order;
- on-screen computer calculator programs with speech synthesis;
- large display screens for calculators and adding machines.

Other possibilities include:

- math overlay for specialized keyboards;
- software that allows students to manipulate objects and geometric shapes;
- assistive technology that assists in reading and writing for literacy-related tasks in mathematics (word-prediction programs can be customized to recognize math terms);
- electronic math worksheets;
- speech synthesizers;
- internet math games and math sites for the development of numeracy skills;
- alternative keyboards for numeracy;
- colour coding for maintaining columns;
- big number buttons and large keypads;
- textbooks on CD-ROM;
- videotaped math lessons;
- computer-assisted instruction.

Websites focused on mathematics, such as www.nctm.org, or sites related to learning difficulties, such as www.schwablearning.org/index.asp, suggest additional tools.

Assistive Technology Tools to Support Students With Language Challenges

Any software that encourages the use of language skills, grammar skills, and vocabulary development using a variety of techniques – such as videos, audio, games, computer-assisted instruction – can help all students. Specialized software containing tools that will enhance receptive and expressive language learning are also available. Most of these programs were originally designed for very young learners but have been found useful for developing literacy skills, especially for students who have English as their second language. They normally feature picture symbol representations with, or in place of, words; speech synthesis that will allow verbalization of graphics and symbols; and/or tools that allow the student to make and/or use “talking books”.

Assistive Technology Tools to Support Students With Sensory Challenges

Closing the Gap (www.closingthegap.com) is the largest organization related to learning and assistive technology in the world. It provides a significant directory of hardware and software appropriate for students with sensory challenges, such as:

- electronic braillers;
- electronic viewers that can magnify text and images on the screen and provide diagrams from various perspectives;
- Picture Exchange Communication Systems (PECS) symbols that are designed to assist communication in social contexts;

- Math Braille Talk, which allows the user to input mathematical terminology and diagrams vocally and have them come out as braille;
- videos that allow for closed captioning and for training.

Assessing the Quality of Assistive Technology Tools

There is little doubt that computer technology can provide some students with a powerful alternative method for demonstrating learning (e.g., multimedia, PowerPoint presentations, publishing software). Teachers should be encouraged to use a variety of technologies in their teaching, including assistive technology, to ensure the best possible student outcomes. In many cases, the assistive technology is an assessment accommodation for the student and must be provided during assessment and evaluation activities. But how does a teacher know if any assistive technology can help a student function more effectively in the classroom, or in a particular subject? There are many organizations to help a teacher find out, such as Closing the Gap and the National Assistive Technology Research Institute, based at the University of Kentucky. But for a quick assessment of the quality of a particular assistive technology tool, Table 16 may help.

Table 16. Assessing the Value and Usefulness of Assistive Technology

Consider each of the following "quality indicators" and check off the box that most closely describes the rating you would give a particular assistive technology tool with respect to each indicator. These indicators are by no means exclusive or exhaustive, and your assessments may differ from those of another teacher.

The completed table will help you identify barriers or next steps to improving students' ability to demonstrate learning in your classroom.

Quality indicator	**Unacceptable (=1)**	**Somewhat useful (=2)**	**Acceptable (=3)**	**Very useful (=4)**
Level of independent use by the student				
Alignment with curriculum expectations				
Usefulness for task completion				
Ease of use				
Accessibility of equipment				

Where We Go From Here

Are we using assistive technology effectively? This is a critically important question. The National Assistive Technology Research Institute is asking important questions to try and help us answer it:

- *About students:* What are students' needs and abilities? Why does a student need assistive technology? What are the major areas of concern that need to be addressed?
- *About the learning environment:* Where and when will the student use assistive technology? What supports and resources are available? How can the computer be accessed for ease of use for student learning and instructional demands?
- *About tasks:* What does the student need to be able to do that is difficult for the student at this time? What is the expected level of independence?

A teacher and classroom may be ready for computer-based assistive technology when:

- **the teacher can answer "yes" to the following statements:**
    - I am trained and able to use assistive technology.
    - Appropriate and effective hardware is available and accessible.
    - Everyone involved understands what is happening and why.
    - I can access ongoing support.
    - I know the strategies that must be taught to the students.
    - I have positive perceptions and attitudes towards electronic tools.
- **the teacher can provide an informed answer to these questions:**
    - Why do I want or need computers in my classroom?
    - What do I want them *to do* (that I could not do without them)?
    - What will they do for my students?
    - What are the (programmatic and curriculum) outcomes we must expect from their use?
    - What (new/extra) skills will the students need in order to use them?
- **the teacher can address these key instructional issues:**
    - How will this specific assistive technology affect what I do (the way I teach, assign, and evaluate)?
    - How will this assistive technology affect what the student does?

11

Professional Development

> *"As teachers deepen their understanding, they change their practice, and as they improve their practice, students' learning improves commensurately."*
>
> *(O'Connor, 2004, p. 228)*

One of the many challenges that classroom teachers face is the diversity of the student population. In order to meet the varying needs of all students in the classroom most effectively, teachers need to create learning environments that allow all children to access the curriculum, participate in the learning activities, and meet their learning goals. A teacher's ability to create such an environment partially depends upon the extent to which he or she:

- understands how children acquire literacy and numeracy skills;
- understands evidence-based instructional techniques and development of skills that promote children's literacy and numeracy;
- understands assessment practices that guide instruction and the development of skills for students with special education needs.

With advancements in evidence-based research and our understandings of students' unique learning strengths and areas of need, teachers are presented with the additional challenge of not only acquiring this new knowledge and understanding, but also implementing them in their classrooms. Collectively, these demands require teachers to be life-long learners with respect to the vocation of teaching. In addition, teachers must be provided with opportunities to reflect upon their professional strengths and needs. Only through this process will teachers be able to best serve their students.

Key Characteristics of Professional Development

Professional learning opportunities should include a number of key characteristics:

1. **Professional development should be accessible and relate directly to the realities of the classroom.** It should also include follow-up support, such as mentoring, coaching, and/or lead teacher consultation, and address how the support will be sustained.
2. **Professional development should be realistic in the scope of the changes required.** It requires time to assimilate, integrate, consolidate, and implement learning opportunities. The professional development plan is an ongoing multi-tiered process that can be subdivided into workable elements, such as sequential objectives. It should be progressive and goal-oriented, and provide a range of delivery options with multiple entry levels.
3. **Professional development should include the expertise of other professional and community organizations.** Professional development cannot be successful without ongoing collegial relationships among learners as well as appropriate resources to support learning and collaboration, such as online learning communities, time, and access to opportunities. Professional development should be designed to encourage communication at all levels, build a culture of collaboration, facilitate interaction, and develop common goals and a shared vision among *all the relevant stakeholders* (e.g., parents, students, teachers, community), supported by principals and senior administrators. Everyone can be potential knowledge providers (knowledge generators, mentors, coaches) and not simply recipients of knowledge. For example, parents of a visually-impaired child may be able to provide critical knowledge regarding strategies and environmental considerations that may optimize their child's learning in the classroom. In addition, teachers benefit from contact information about various community-based agencies and other professionals who focus on children with special learning needs, and should be encouraged to contact them as needed, and use the resources they provide.
4. **Professional development should be significant to teachers' own practice and learning needs.** It should incorporate reflection on practice, be based on individual learning needs, and encourage a cyclical process of discussion and practice.
5. **Professional development should be linked to observable behaviours (e.g., academic achievement, social peer relationships, reading ability, engagement of students).** This approach provides teachers with guidelines for observing the impact of their instruction on student and classroom outcomes. Teachers can broadly measure outcomes in terms of the impact on students (attitudes, behaviour, learning) and benefits to teachers (less stress, better use of instructional time, more opportunities for reflection).
6. **Professional development should keep up with current mental health and legislative issues.** These include the right for some children to receive specialized support within the classroom, or legislation such as the Accessibility for Ontarians with Disabilities Act (AODA) and the Human Rights Code.

Questions to help teachers assess their need for professional development

1. Am I familiar with the learning and emotional needs of a child with a particular exceptionality?
2. Do I possess information and training about the types of curriculum-based, organizational, and management strategies that are needed in order to provide effective instruction for the diverse array of learning needs in the classroom?
3. Do I possess specific information about how to design my classroom instruction so that it incorporates principles of universal design and differentiated instruction?

Maximizing Literacy and Numeracy Instruction

A teacher's ability to create a learning environment that allows all children to access the curriculum, participate in the learning activities, and meet their annual goals and learning expectations depends upon the extent to which he or she knows and understands many of the areas covered in this report.

To help teachers provide optimal instruction for all students, inform their practice, and/or identify areas of expertise that can be used to support the knowledge and skill development of other professionals, professional learning opportunities should focus on:

- the learning and emotional needs of students with special education needs;
- the learning processes for literacy and numeracy;
- the types of curriculum-based, organizational, and management strategies necessary to provide effective instruction for the diverse array of learning needs in the classroom;
- how to design classroom instruction so that it incorporates principles of universal design and differentiated instruction.

There is no one pattern of needs, however; they differ according to the respective requirements of stakeholders – from the teacher right through to the provincial government.

To ensure that professional development is implemented effectively and addresses each of these focus areas, the provincial government, professional associations, school boards, and schools need to demonstrate significant and planned professional support. Only if these initiatives are coordinated at the school and board levels will we be able to define specific patterns for professional development, set priorities and responsibilities, and make plans for ongoing professional development. This is no small effort, but coordination and sharing of responsibilities are essential if teachers are to experience the full benefits of being part of a community of learners and not feel isolated in their efforts.

Table 17. Shared Responsibilities for Professional Development

Areas for Professional Development	Examples of Shared Responsibilities
Universal Design and Differentiated Instruction	**Ministry of Education** provides province-wide opportunities to administrators and teachers. **Universities** integrate universal design and differentiated instruction into preservice and in-service courses and workshops. **School boards and schools** offer teachers opportunities to develop partnerships for sharing experiences and plans for incorporating universal design and differentiated instruction.
The Learning and Emotional Needs of Students	**Ministry of Education** provides opportunities to help ensure that items detailed in reports and manuals are understood. The ministry could provide regional training sessions to highlight and reinforce knowledge, perhaps by developing a distance education Internet site. Specific professional development opportunities in the areas of early assessment and assistive technology are essential.

(continued)

Table 17. Shared Responsibilities for Professional Development (continued)

Areas for Professional Development	Examples of Shared Responsibilities
	School boards and schools determine the priorities that parallel their policies and populations. Boards need also to identify community agencies that have expertise with various special-needs populations (such as the Council for Exceptional Children, special education advisory committees, and provincial parent associations), which could provide training and/or support for teachers. Schools provide administration of particular needs and priorities. **Professional and community associations** identify resources that will support prime issues for their members.
The Learning and Assessment Processes for Literacy and Numeracy	**Ministry of Education** provides ongoing professional development seminars and workshops focusing on Expert Panel reports and ministry guides to effective instruction in literacy and numeracy. **School boards** provide opportunities for local "trainers" to interact with school administrators and selected classroom teachers on major elements covered in Expert Panel reports and ministry guides to effective instruction. **Schools** continue this process with school-based opportunities for enhancing these elements in keeping with local needs and strengths. School principals plan for mentoring and encourage the sharing of good practices. They need to allow for time to reflect on and refine instructional practices.
Curriculum-based, Organizational, and Management Strategies	**Universities and colleges** provide courses and workshops on specific planning and instructional strategies as part of their preservice and continuing education programs. **Professional associations** identify priorities and resources to support emerging needs or concerns of their members. These organizations may need to provide local, regional, and provincial opportunities for specific development and help identify local mentoring supports.

Professional Development Models and Formats

We suggest that serious attention be given to the following considerations regarding professional development:

- **Professional development should be offered not only to teachers but also to teacher's assistants, support staff, and administrators.**
- **A variety of professional development models should be encouraged.** They need to range from informal study groups, through more intensive, collaborative professional and community workshops, to more formal coursework (e.g., Additional Qualification courses). Models must encourage or permit multiple entry points to allow for individualization. Possible resources or opportunities include:
  - in-board teams;
  - multimedia, including video conferences, distance education, online courses, and Internet workshops;
  - in-school facilitators (e.g., "lead" teachers in subject fields and in special education);
  - community resources (e.g., Learning Disabilities Association of Ontario: chapter libraries and personnel);
  - books and professional journals;
  - opportunities to participate in ongoing research;
  - opportunities to participate in case studies and/or reflective discussion.
- **Mentorship should be encouraged.** It is well recognized as an effective model, acknowledges individuals' expertise and specialized knowledge/skills, provides opportunities for informed sharing and discussion of instructional methods and techniques, and encourages individuals to be risk takers when implementing effective instructional approaches. Most important of all, participation in mentorship produces benefits for all those involved – especially students (Cruzeiro & Morgan, 1999).

For any professional development to be effective, teachers should have designated time for collaboration and planning, and easy access to resources and information. Print-based materials and multimedia texts can be combined with school-based facilitators.

Among their resources, educators can use technology:

- for literacy and numeracy training (e.g., www.eworkshop.on.ca);
- for professional development, research, and the development of professional communities to access resources;
- as a tool that can be used to design instructional activities (e.g., the Ministry of Education's Curriculum Unit Planner at www.ocup.org);
- as a teacher's companion for special education, assessment, and ESL (e.g., www.ocup.org/resources).

12 Recommendations

The Expert Panel on Literacy and Numeracy Instruction for Students with Special Education Needs offers the following recommendations to guide schools and school boards in allocating funds and human resources to support literacy and numeracy instruction for students with special education needs from Kindergarten to Grade 6.

Funding is important, but funding alone will not make the difference for students. The programs and supports that school boards implement must be founded on evidence-based research. The effectiveness of instruction must be monitored carefully in order to ensure that students with special education needs succeed to their fullest potential.

These panel recommendations focus on the following themes:

- Professional Development
- Assistive Technology
- Program Planning and Implementation
- Teacher Education

Professional Development

Professional development for Ontario teachers is a shared responsibility of the Ministry of Education, district school boards and school authorities, school principals, teachers, and other support staff. Consistent with current research on the effectiveness of various professional development approaches, the Expert Panel makes the following recommendations:

1. **Classroom teachers should receive training on the instructional strategies and content in this report.** Specific professional development around instructional strategies in literacy, numeracy, and assessment for students with special needs should be provided for classroom teachers, with particular emphasis on early intervention, curriculum-based assessment, and progress monitoring. Universal design, differentiated instruction, and evidence-based practice should provide the context for professional learning.

2. **All teachers should be able to access professional development in the use of assistive technology.** While many teachers have significant skills in using instructional technology in their teaching, it is imperative that teachers also receive effective professional development to successfully implement and embed assistive technology when teaching students with special needs.

3. **Professional training should teach educators in the way they learn best: by observing and doing.** *Teachers need the opportunity to observe successful, evidence-based practice in action in order to calibrate their own goals for practice.* Demonstration classrooms would allow teachers to see master teachers enact the teaching, organizational, and management strategies that this report describes only briefly. *Mentorship is crucial.* Just like their students, teachers need guided practice when learning new strategies and concepts about teaching. This can be accomplished by enabling a master teacher who is up to date on evidence-based practice to coach and mentor a teacher in his or her own classroom.

4. **Professional development opportunities must provide both ongoing sustained learning and just-in-time information and support.** Professional development needs to range from informal sessions (e.g., study groups), through more intensive, collaborative professional and community workshops, to more formal coursework (e.g., Additional Qualification courses). Professional development models should encourage or allow multiple entry points to meet individual teachers' requirements. Among the possibilities:
   - in-school study groups with access to books and professional journals;
   - multimedia training, such as video conferencing, distance education, online courses, information-based websites, and accessible telephone support;
   - in-school facilitators and mentors;
   - collaboration with universities, colleges, and community resource agencies;
   - support for action research, case studies, and other reflective practice.

5. **School board staff, principals, teachers, and support staff should receive training in successful practices in supporting students with special needs.** Students benefit when all members of the professional learning community share the same values and goals. Senior administrators, principals, and support staff, as well as teachers, should receive training around successful practices in supporting students with special needs.

Assistive Technology

Assistive technology is a powerful tool. The Expert Panel believes that Ontario schools can use it more effectively to support students with special needs, and therefore makes the following recommendations:

6. **School boards need to create institutional structures that support the responsible use of assistive technology.** Accountability for assistive technology equipment is essential. The panel recommends the initiation of a comprehensive system that tracks needs assessments, implementation, and gap analyses. A statement of how assistive technology is used should be a mandatory part of each district school board's special education plan.

7. **The Ministry of Education and school boards must make the development of additional assistive technology tools for francophone students a priority.** There is much more and a greater variety of assistive technology available for English-speaking students than for francophone students with special needs.

Program Planning and Implementation

Decisions that school boards and schools make in program planning and implementation can have a significant impact on students with special needs. For this reason, the Expert Panel makes the following recommendations:

8. **The Ministry of Education should ensure that students with special education needs are included in educational initiatives.** When school boards apply for funding to the Ministry of Education for initiatives, the ministry should require a component outlining how students with special needs will be included.
9. **The Ministry of Education should provide criteria to school boards that can be used to assist with programming decisions.** Boards need to make programming decisions based on evidence-based research. Criteria developed by the ministry on the basis of such research could be used by school board personnel to evaluate the effectiveness of current programs and plan for the implementation of new programs for students with special education needs.

Teacher Education

Preservice teacher education is the appropriate place for an introduction to the characteristics of successful practices for supporting students with special needs. The Expert Panel therefore makes the following recommendation:

10. **Ontario university programs leading to a B.Ed. degree should contain mandatory course hours on special education.** Given the numbers of students with special education needs receiving instruction in regular classrooms, every Ontario teacher needs to be prepared to provide effective instruction for all students.

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